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Automatic Arc Welding

Applications of the Process at the General Electric Company's Schenectady Plant—Manufacturing Solenoid Brake Wheels—Seam Welding—Repairing Armature Shafts

BY A. K. WEST

A LITTLE OVER a year ago the automatic arc welder was brought to a state of practical application. It is now used in the manufacture of a number of products in some of the General Electric Company's plants as well as for various kinds of repair and reclamation work. The manufacturing processes are on the quantity basis and the variety of products is sufficiently large to give an idea of the extent of the field to which the automatic welder may be applied.

This welder is a device for automatically feeding a bare electrode to a welding arc at the rate required to hold a constant arc length. The welding head consists of a steel body carrying feed and straightening rolls which pull the wire from the reel, straighten it, and feed it to the work. The rolls are adjustable for sizes of electrode wire from $\frac{1}{16}$ to $\frac{5}{32}$ inches in diameter. In applying the automatic welder it is necessary to provide some means of moving the arc relative to the work, or vice versa. The majority of arc welding work comes under two general heads, straight line and circular welds, spiral welds being a combination of the two. For such cases, various types of existing machines have been used successfully as a base for the application of the electric welder. Such machines are lathes, for obtaining line welds and spiral welds, and boring mills or turn tables for circular welds. In some cases, however, the welding path is complicated or irregular. It is for these that special machines have been designed in order to obtain the proper travel, either of the work or of the welding head. Also, some of the articles welded are too heavy and bulky to be mounted on ordinary machines and have required the designing of special machines to handle them.

One of these built for the welding of side seams in large oil circuit breaker tanks is shown in Fig. 1. The tank is clamped in position on an I-beam with a copper strip on the upper flange, the strip serving as a backing for the weld. The welding head and the wire reel are mounted on a traveling carriage above this beam. The carriage is driven by a long screw shaft between the upper supporting beams, by a motor at one end of the machine.

The welding head is driven through a splined shaft by a motor at the other end. The two driving motors are so interlocked that when the arc is struck the travel motor starts, simultaneously, and if the arc is broken for any reason the travel motor stops. Dynamic braking of the travel motor prevents drifting and insures the starting of the weld at the point where it left off. The rate of welding on this machine, which handles seams up to 108 in. in length, is about $2\frac{1}{2}$ in. per minute, varying, however, with the thickness of the material to be welded. Another type of machine has been designed for welding on the bottoms of smaller tanks. It appears in Fig. 2. The welding path in this case is so much more complicated that a different mechanism is required. The outline of the path is two semi-circular ends, joined by tangential sides. In this case the arc is held stationary and the work moved past the point of contact by a rack which engages with a small pinion driven by the travel motor through the gear train.

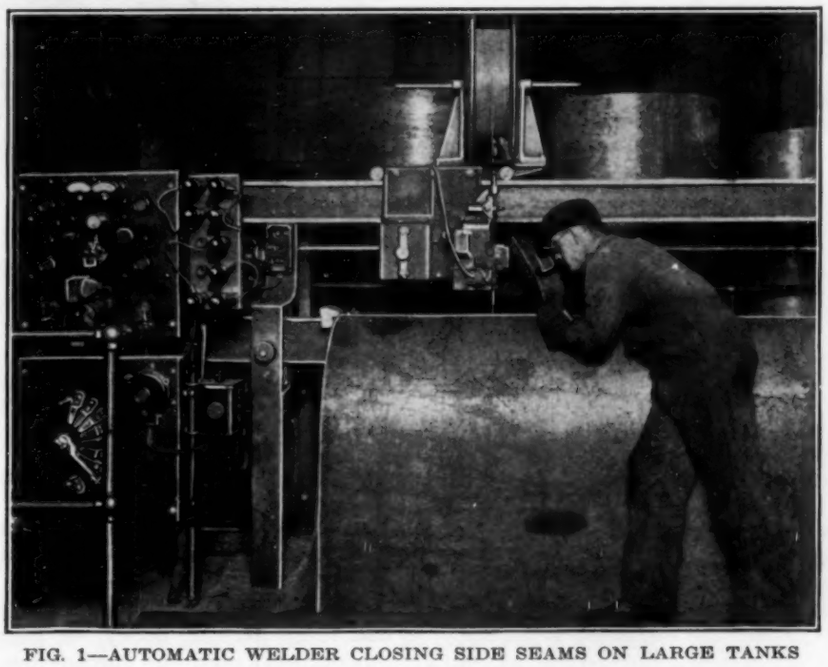


FIG. 1—AUTOMATIC WELDER CLOSING SIDE SEAMS ON LARGE TANKS

An interesting case which has resulted from the application of the automatic welder to production work is the fabrication of brake wheels for solenoid brakes. Formerly these wheels were cast, but so much trouble was experienced from blow holes that showed up when the wheels were machined, rendering them a total loss, that a new welding process was devised to make them. The machine is shown in Fig. 3. The wheels are fabricated from three parts, the hub, cut from a piece

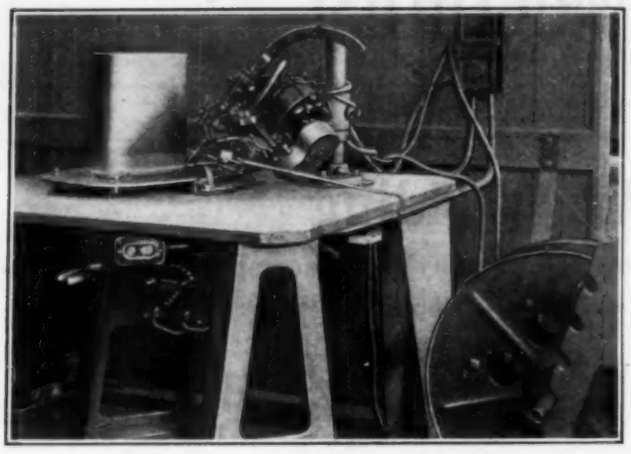


FIG. 2—AUTOMATIC WELDER ATTACHING TANK BOTTOMS

of steel shafting, the web and the rim, which are both cut from boiler plate, the latter being rolled into shape, and the ends joined by welding. (Fig. 2.) The three are then mounted together on a turn table and welded together to form the finished wheel shown in Fig. 4. Not only does this process save the money that was formerly lost in scrapped wheels, but it obviates making a special pattern and mold for every special type of wheel wanted, requiring tapered shafts, offset rims, etc.

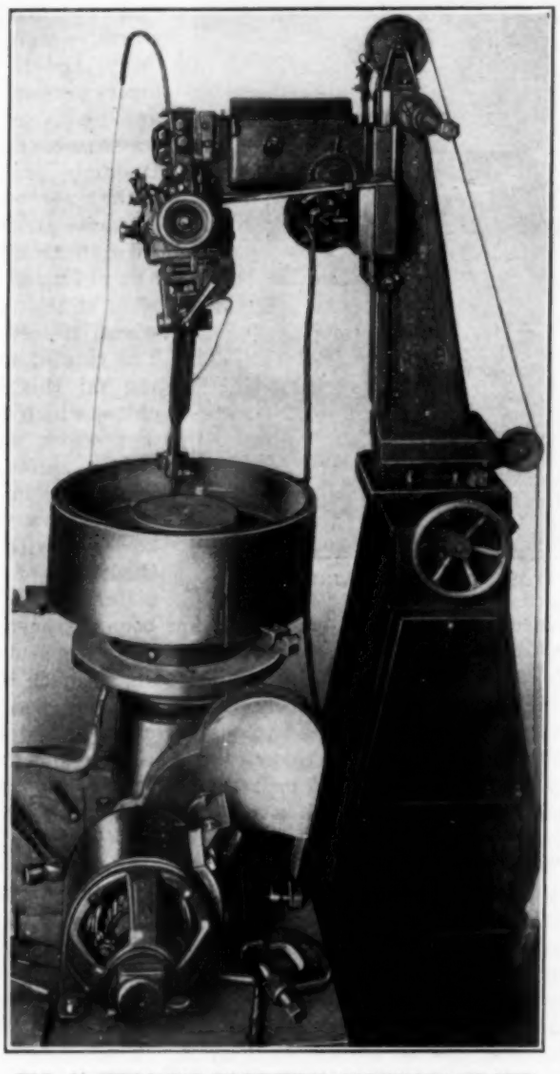


FIG. 3—WELDING TOGETHER SOLENOID BRAKE WHEEL PARTS

These three processes are by no means the only ones that have been improved by the application of automatic welding. The method is now applied to the manufacture of a number of products that were formerly cast or riveted, with the usual expenditures and rejects that attach themselves to those methods. A few of these articles are railway motor gear cases motor frames, motor bearing shells, flow meter nozzles, and condenser cans. Both butt and lap welding are employed and the thickness of the metals welded varies from $\frac{1}{16}$ inch for the condenser cans to $\frac{3}{8}$ inch for the motor frames and some of the other larger articles.

The automatic process has also been very successfully applied to various kinds of reclamation and repair work, with considerable saving of money and material as a result. One such case is that of several large and expensive shaft forgings that were improperly machined, or required increases in diameter after being machined.

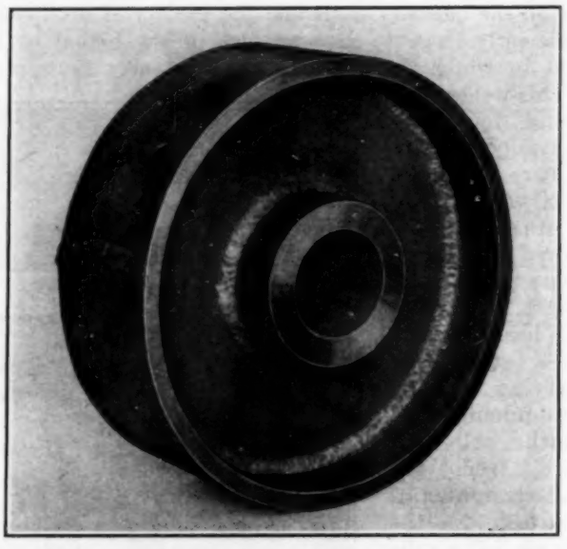


FIG. 4—THE COMPLETED SOLENOID BRAKE WHEEL

The shafts, which in some instances would have been a total loss, have been reclaimed in a very few hours and at a nominal expense.

Another case is that of armature shafts that have had their journal, pulley, or gear fits worn so as to render them unfit for further use. Over 400 of them have been reclaimed by welding with the automatic equipment, the metal being deposited on the shaft to any desired thickness and then machined to proper dimensions. In many cases the insertion of a shaft would necessitate the complete disassembling of the armatures, as in many of the smaller sizes the laminations are assembled directly on the shaft.

The result of the application of the welder to both manufacture and repair have been highly satisfactory. The automatic machine deposits metal much faster than is possible with hand welding, and the resultant weld is better both for smoothness and evenness of the deposited metal. The main consideration in designing machines for carrying either the work or the welding head, or in adapting existing machines to these purposes, is to insure a steady and uniform rate of travel of the arc along its path, and proper interlocking between the arc and the travel mechanism, so that simultaneous starting and stopping will be assured.

What's Wrong with the Railroad Shops?—II

The Show Machine and Its Use and Abuse—Desire of the Men to Make a Showing When Possible—General Condition of Equipment

ONE GETS THE impression when talking with the average railroad shop man that the railroad shop is an institution by itself, only remotely related to the machine shop and other industries, somewhat like the relation of the horse and the frog; they are both vertebrates but that is about all. Those responsible for the running of the ordinary machine shop realize the importance of keeping in close touch with all that goes on, not only in their own industry, but in other industries as well. They are constantly on the lookout for new methods, and, whenever they read or hear about some new development in some other line of industry, they weigh the possibility of applying this improvement to their own conditions.

It is true, not all do this and it is also true that a certain amount of inertia and conservatism on the part of the workers, and often, of foremen and superintendents must be overcome, but, stated briefly, it is true that the manager of the machine shop keeps his eyes open for better things and better methods. He must. Competition compels him to. Even without competition there would still be the constant urging of the directors for reduced costs and for increased profits—a good stimulant.

He studies the technical magazines devoted to machine shop methods, new machinery and tools; he visits other plants to get new ideas, and, on the whole imparts as much information as he gets. He sends his superintendents and foremen out on occasional trips and even if these men do not return with revolutionary ideas in regard to shop operations, they come home refreshed and encouraged and full of enthusiasm. Sometimes they return humbled and chastened by what they have seen others do, but in any case they come back better men.

The manager sees the salesmen of the machine and tool manufacturers and the makers of other equipment and considers these men not as so many book agents, nuisances to be gotten rid of as quickly as possible, but as the carriers of valuable information. If he finds that the purchase of new equipment will lead to new economy he tells the purchasing agent what to buy. He has joined various associations and urges his subordinates to join them for the purpose of keeping abreast of the times, of listening to discussions or taking part in them and of obtaining much information which is enthusiastically discussed at such meetings and of which much can be used at home.

He encourages suggestions from his assistants and, though he may not always follow them, he considers them carefully. If his time is too much taken up with other duties and he cannot devote the proper attention to technical matters, or, if his training or ability is not along these lines, he calls in an expert from the outside to assist him and his staff, always with the idea that a sufficient broadness of view, a sufficient amount of knowledge cannot be gathered in one plant. In short, he considers his plant as but a single unit in a great system, deriving support from and giving assistance to other units.

If the average shop profits by information obtained from manufacturers of equipment, it is also active in promoting progress in the design of new machinery and tools. The shop makes certain demands for new features, often to the extent of having special machinery built. Such machinery, when proven successful, may become the standard of the future. This insistence on improved features, designs or materials is the very foundation of progress made in machinery and other machinery. Its influence reaches far indeed.

The railroad shop is largely lacking in this broadening interchange and adoption of ideas. How often does one see the master mechanic of a railroad shop ambling through a plant where automobiles or sewing machines or heavy ordnance pieces are being made? For that matter, how often does he visit other railroad shops? If he does there must be something in the management of railroads which prevents him from using the knowledge thus obtained, for a greater lack of uniformity in methods than one finds in railroad shops is hard to imagine, though such shops are more alike in the nature of their operations than almost any other class of industrial establishments.

It must be said here that, in our opinion, the men themselves are not to blame. A number of them confessed they were somewhat ashamed of their ignorance as to what was going on in the outside industrial world, and defended themselves on the ground that they had no chance for observation. Where lies the exact center of the idea that the railroad shop is "quite apart" is not easy to determine. It has existed so long that it has permeated everything. The dilution of the old force with a number of new men recruited after the strike from other shops, from the farms and other outside occupations may kill the old idea. Let us hope so.

The example of the connecting rod mentioned in a

> The condition of railroad shop equipment is a very sore subject. The machinist resents the fact that he has to work with poor tools, the mechanical department official is at his wit's end to get out work with the equipment at hand, the purchasing department is hampered by financial control that restricts the appropriations available for machinery and makes the purchase of cheaper substitutes almost unavoidable. The average board of directors, facing earnings of three per cent, more or less, is hard to convince that a department which is looked upon as an expense, should receive much of the meager income. It seems impossible to prove to regulatory bureaus that their policy is starving the railroads to death.
>
> Our second article shows railroad shop equipment as it is and suggests more efficient use of what is available, as well as the need for replacing the obsolete units with modern ones.

previous article shows how little uniformity there is between different railroad shops. It also shows how an ineffective machine was used and how even this was reduced to about one-third of its capacity by poor tools. Such examples can be found in large numbers. They were standing out all over every shop we visited. As against this, we were shown the pride of the shop, the driving wheel lathe (this did not happen in just one shop, but in practically all).

Though of various makes these machines were all more or less up to date. The driving wheel lathe was the show machine. Fortunately we have seen heavy chips before and are not easily impressed with them unless they are the symbol of rapid production. This is what we noticed:

One driving wheel lathe was heavily overloaded during the roughing cut. The tool rests bent down under the cut like grain before the wind. A cut was taken ½ in. deep and ⅛ in. feed, speed about 16 ft. The machine had the requisite power but not the rigidity for such a cut. The gib for the tool slide was merely a flat piece of cast iron held in place by a number of set screws (a very poor construction). These screws had been set up so tight that they had made their impression on the gib. It bulged at the other side and made a cup shaped depression in the slide so that sidewise movement of the slide was no longer possible until the gib was loosened. Now let us see what was the benefit derived from this brutal performance.

Analysis of Tire Turning Operation

The accompanying sketch, Fig. 1, shows the outline of a tire before and after turning. It also shows the scallops or grooves made by the roughing tool. These grooves may seem exaggerated and so they are but, due to the bending of the tool rests, there were many spots in every groove quite as deep as the impressions shown here. After roughing, a forming cut is taken and the illustration shows clearly how the depth of these impressions makes a very deep forming cut necessary.

It should be noticed that the depth of this cut is several times the depth of the impressions. Now this forming cut calls for hand feed and is, therefore, necessarily a slow operation, so that everything possible should be done to reduce the depth of that cut. If less

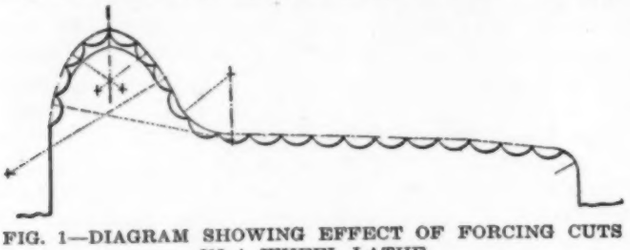


FIG. 1—DIAGRAM SHOWING EFFECT OF FORCING CUTS IN A WHEEL LATHE

feed had been used for the roughing cut with somewhat higher speed, the impressions would have been very much shallower and the depth of the forming cut would have been very much reduced. Possibly five minutes extra might have been spent on the roughing but this would have been saved several times over on the forming.

While talking about this forming, it is a peculiar fact that on the driving wheel lathe a forming tool without rake is used. In a way the railroad shop men are not to blame for this because the lathe does not allow of any other kind of tool. Fig. 2A shows how the tool is now and Fig. 2B how it might be made if the lathe had provision for it. Such a forming tool would cut freer and do faster and better work.

It is perhaps pertinent to state here that such forming tools as shown in Fig. 2B cannot be used on automatic screw machines, for instance, without making provision for vertical adjustment but this is so because on such types of machines the work is of small diameter. The very large diameter of work on a driving wheel lathe would make the loss of height due to sharpening the tool on the face an utterly unappreciable quantity.

We said that the railroad shop men are not entirely to blame, but after all it is up to them to analyze their problems and demand the necessary features in the machine tools they buy to give them the best results.

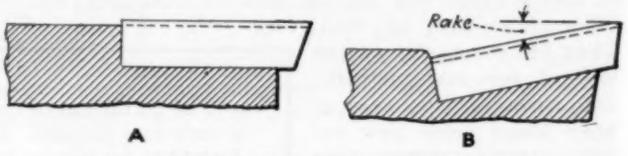


FIG. 2—TOOLS WITH AND WITHOUT RAKE

On the other hand would their demands be heeded by the purchasing agent or by whoever has the final decision, and if not can we blame them if they recognize the futility of analyzing problems when they are not in a position to profit by the analysis?

At another place the driving wheel lathe was of more rugged design and quite capable of taking the cuts imposed on it but here again too much was left for the slow forming operation. In addition, the handling devices were entirely inadequate so that half an hour or so was lost on this account while every effort was made to save a minute on the roughing cut.

Every effort? Well, in a manner of speaking, but the cut had to be interrupted because the tool gave out. Investigation showed too much clearance, with its result, a weakened tool. Besides, so the workman claimed, the steel was soft. What kind of steel? Nobody within hailing distance knew. Maybe the purchasing agent knew but he was not around. How was this defect going to be corrected? Send it back to the blacksmith shop and a tool dresser would try again.

There was probably somebody in authority in the shop who knew what kind of steel it was and what to do to improve its cutting capacity, but the fact that neither workman, foreman nor assistant superintendent knew these things is significant. It does not make for intelligent co-operation.

Men Anxious to Make a Showing

We could not help but look at the driving wheel lathe performance from different angles. The eagerness to show the heavy cuts proved that the men had the desire to break some records and grasped one of the few opportunities they had to do so. They seemed to realize that the greatest part of their equipment would not allow them to make a showing. There were just the driving and car wheel lathes and the tire boring machines which would give them that chance. With the evident desire to do themselves proud it would seem that the main thing required for an up to date shop, the willingness to make it so, was there. What was lacking was evidently training in modern shop methods, equipment and a certain amount of freedom of action which is so necessary for development.

Another angle which presented itself is this, why was

there an up to date driving wheel lathe when the rest of the equipment was mostly below par? Why was this so in most shops? The answer seems to be that the driving wheel lathe, the car wheel lathe and the tire boring machines are machines specially built for the railroad shops. The makers compete with each other and bid against each other with improvements. A driving wheel lathe must be a driving wheel lathe; it would not be possible to substitute any other kind of a lathe for it and so the buyer is compelled to get the up to date thing if he buys at all. This is true of all equipment built for railroad shops only.

A different condition exists in relation to other equipment. A lathe is a lathe in the eyes of such a disinterested spectator as a purchasing agent may be. Nobody is making any particular effort to make milling or drilling machines especially adapted to the railroad shop because there are not the special requirements to be met as was the case with the driving wheel lathe, the car wheel lathe, the tire boring mill or the double and connecting rod boring machines. Unless, therefore, the men most interested, the men who are supposed to know, specify the kind they want they will get what seems to the purchasing agent the most advantageous purchase. Unfortunately in many cases the shop does not have the privilege of specifying and in others where they do specify, the purchasing agent has the privilege of ignoring the demand of the shop.

Though the modern tire boring machine is also one of the show machines in the better equipped railroad shop it will be found that there is such an astonishing lack of uniformity in the practice of tire boring that it is extremely difficult to find any explanation for it except the one that each shop follows its own ideas without any regard whatsoever for the experience of others. We refer the reader to an article appearing in the *American Machinist* of Aug. 21, 1922, entitled "Angles of Cutting Tools," by J. Herron, in which the author shows that feeds and speeds, angles of tools and everything else in relation to this operation vary within the widest imaginable limits, showing that nobody has profited by the experience of anybody else.

It would seem to us that this utter lack of systematic co-operation, or let us call it intercourse between the various railroad shops, and especially study of practice of shops in other industries, is responsible for much that may be criticised in the railroad shops of today. A thing entirely apart from the men, their ability, their relations with each other or with the outside world is the average condition of the machinery. A railroad shop must be a healthy place for a machine tool judging by the number of old and venerable tools found there. With very few exceptions, there are a number of tools in each railroad shop that had probably reached a comfortable middle age when wood burning locomotives were all the style.

The claim that railroads are poverty stricken does not explain the existence of so many relics for most of them must have been old when the roads were prosperous and mighty. The only reasonable explanation seems to be that the railroad shop is the step child of the company, on which money is spent only when there is no way out of it.

To enumerate the many old and dilipidated machines noticed, would be to give a dreary list containing many names of fossils, known to science only. The condition must be seen to be appreciated. It is our opinion that the railroads could not spend money to a better or more profitable purpose than by cleaning out the old junk and replacing it with the proper kind of modern machinery.

These Figures Show No Standardization of Catalog Sizes

During a period extending over several months, the *American Machinist* recorded the sizes of the catalogs it received. The total of catalogs was 190, the total of sizes 62. Herewith is the tabulation:

Size	Quantity	Size	Quantity
1⅜ by 5½	1	6 by 9	33
3¼ " 6	1	6¼ " 9½	2
3½ " 6½	1	6½ " 9½	1
3½ " 5½	1	7 " 10	2
3½ " 6	7	7 " 11	1
3½ " 6¼	3	7¼ " 7½	1
3½ " 6½	1	7¼ " 10	1
3½ " 8¼	1	7½ " 9	1
3⅝ " 8	1	7½ " 10½	2
3⅝ " 8¼	1	7⅝ " 10½	1
4 " 6	1	8 " 9	1
4 " 7	1	8 " 10	3
4 " 7½	1	8 " 10½	9
4 " 8½	1	8 " 11	3
4 " 9	8	8¼ " 10½	2
4¼ " 5½	1	8¼ " 10½	1
4¼ " 6⅝	1	8½ " 10½	1
4⅜ " 9½	1	8½ " 11	57
4½ " 7¼	2	8½ " 11½	1
4½ " 7⅝	1	8⅝ " 11	1
5 " 7	3	8⅝ " 11½	2
5 " 7½	2	8¾ " 11½	2
5 " 8	3	8¾ " 11¾	1
5¼ " 7¼	1	8⅞ " 12	1
5¼ " 7½	1	9 " 10½	1
5½ " 8	1	9 " 12	4
5¼ " 8¼	2	9¼ " 43	1
5¼ " 9½	1	11 " 14½	1
5½ " 8	1	15½ " 22	1
		17 " 22	1

The majority, it is pleasing to note, were 8½x11 in., a size that is logical on account of its present acceptance as the standard letter sheet. For the catalog that will be used in the office and salesroom and carried in brief cases, that size is probably the best. The pocket size, say 4x6 or 5x7, as a second size, has much in its favor.

As the first step, a standardized size should be determined. After that, refinements, such as punching for a standard binder, should be considered.

Two Hundred Miles per Hour Necessary for Commercial Aviation

Commercial aviation can hardly be accomplished until a speed of 200 miles per hour can be maintained. This opinion has been expressed in connection with the study of results at the Detroit meet. At slower speeds aircraft can rarely be expected to compete with other forms of transportation.

When the distance between Chicago and New York can be covered in two or three hours or San Francisco can be reached in 15 hours of continuous flying from New York, there would be a demand for the service, despite its cost. Only three days of daylight are lost to the passenger who crosses the continent by rail. By the impracticability of night flying no great amount of time is saved to the passenger who undertakes the journey by air under existing conditions. The possibilities of commercial aviation are unlimited and now depend on speed development.

Inclusions in Aluminum-Alloy Sand Castings

By R. J. Anderson

Technical Paper No. 290, of the Bureau of Mines, Department of the Interior, is the result of the suggestion made by a number of foundrymen that the bureau investigate hard spots, put the available information on record and suggest preventative methods. Hard spots, due to foreign matter other than iron, originate in the foundry and can be prevented by not allowing such materials to get into the melting furnace.

When the melting room and foundry floor are being cleaned to gather up small pieces of metal, sloppings and overruns, dirt, gravel, sand, cement, brick and chunks of broken crucibles are swept up. Unless these sweepings are sieved and forked, such materials are likely to be charged into the melting furnace. Whether under fast practice or a moderate rate of production, it will pay to watch the quality of the melting charge. Some of the foreign material may be removed by skimming and fluxing, but if this material is readily wetted by aluminum and is of nearly the same density, it will remain in the liquid metal and will ultimately appear in the castings.

Crucibles should not be used too long or until they become cracked and readily friable. No core sand should be left in defective castings that are remelted, as the hard, fine, silica particles may give rise to small hard spots. Foreign non-metallic hard spots can be largely eliminated, provided sufficient attention is given to the charging practice.

Limiting the Iron Content

In regard to the hard spots caused directly or indirectly by iron, the iron content of No. 12 alloy or of other alloys made from secondary ingots can be kept within reasonable limits by using only such ingots as are reasonably low in iron. Difficulties brought about by the use of secondary ingots or scrap castings purchased from outside sources, can be readily eliminated by chemical analytical control. Actual irony hard spots caused by charging nails, core wire, chills and bits of iron and steel can be prevented by careful attention to the quality of the charge.

Mechanically admixed iron appearing in the foundry scrap or in floor sweepings can be removed by screening and forking, or by electromagnetic apparatus if required. If small loose scrap is charged by fork rather than by shovel, small particles of iron or non-metallic particles should readily fall between the tines of a fork, whereas they would be retained by the shovel and go into the charge. However, if too much scrap is picked up on the fork, the small pieces will not fall through and forking does no good. Unless small forksful of scrap are taken and the scrap shaken up and down on the fork, forking is useless. In certain foundries, forks are used like shovels, but if they are not used correctly they may as well not be used at all.

The practice of charging borings and turnings has practically been abandoned and these materials are usually run down into ingots before charging. In a machine shop, however, iron and steel drillings and turnings may become admixed with aluminum-alloy borings. Unless it is known that aluminum-alloy borings are free from mechanically admixed iron, they should not ordinarily be charged directly. At best it is not good practice to use borings in melting charges because of heavy dross losses.

Hard spots, due to the brittle, complex, ferro-aluminum alloy which forms on the sides of iron pots, may be largely prevented by thoroughly scraping the pots at frequent intervals and by removing the accumulated scale. If eight or nine hour practice obtains, the pots should be scraped at least once a day, say at night, and preferably twice a day, at noon and at night. If two shifts are working, more frequent scrapings will be advisable.

All of the hard alloy should be removed so that the pot is clean and, if necessary, the pot should be dumped. Moreover, during the time the pot is in the melting operation, care should be taken that ladles or stirrers do not hit the sides of the pot. Otherwise, some of the accumulated scale may be knocked off. In the same way, the scale may be dislodged at charging time. By careful attention to the foregoing precautions, the occurrence of hard spots in aluminum-alloy castings that give rise to difficulty in machining and polishing can be largely eliminated.

A complete copy of the paper may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the price of ten cents.

Machine Shop Bulls—IV

By Joe V. Romig

Ed was working on a long center shaft, 3⅛ in. in diameter and 14 ft. long. This shaft was a red rush job; the mill in which it was used was shut down, men were idle and had to be sent home, and an express car stood waiting to ship it the moment it was finished.

The shop super and foreman had strict orders to rush it through and had given it to their best lathe hand because they could trust him. Every pad had been turned accurately to size and all that still remained was to taper bore the lower end for the thrust bearing spud. Working fast, Ed took a chance without "miking" his bore soon enough, and bulled the job, the roughed hole being ¼ in. oversize.

To admit the bull meant the scrapping of the shaft, costly delay to the shut-down plant of the customer and possibly dismissal. A quick conference with his pal decided the course of action. Ed was to bore out the over-size hole to exactly 2 in. in diameter, and Joe, his buddy, immediately turned up a 2-in. plug to fit. This plug exchanged hands quickly and secretly and was socked into the finished bore, a light tapping fit.

The dog was still in position on the plug, and this dog was used when the lathe was started up in low gear to make out the cut-fast fit, the only possible way which they had to tighten the plug without causing suspicion. The plug, fitting neatly, allowed the shaft to make a few revolutions, when it smashed its supporting block into splinters and cut fast like a good fellow.

A few minutes of high-speed turning and drilling made a new hole, dead to size and taper, and the shaft went out of the lathe to the inspector's bench without a soul being the wiser. All had been done so quickly and quietly, that no one knew of the bull but its maker and his buddy. As far as the strength and mechanical fitness of the job was concerned, everything was above board; and by taking this bull by the horns, Ed saved himself an embarrassing situation.

Bulls will creep in once in a while for everyone, and although they are the most unwelcome of creatures in a shop, they must be handled with philosophy and reason.

Multiple Fixtures for Milling Small Parts

A Description of Fixtures Used in Milling Service Machine Parts—Design Applicable to Fixtures for Parts of Other Machines

BY C. E. STEVENS
Chief Engineer, White Sewing Machine Co.

IN DESIGNING multiple fixtures, a considerable amount of thought should be given so as to get the largest amount of production with the least amount of expenditure for tools. The fixtures should be made substantial to withstand the cut and still be simple as possible, both for loading and replacing worn parts.

The accompanying photographs show fixtures used on milling operations for small parts on sewing machines, which increased production from 200 to 400 per cent, with a very small amount of tool cost. These fixtures have been in use for over two years proving very satisfactory and, with slight changes, could be used on other classes of work.

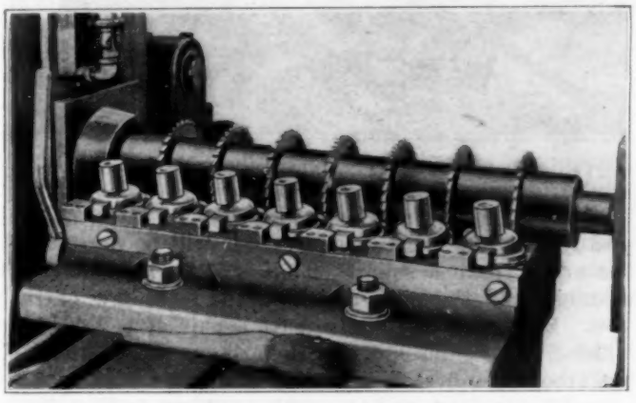


FIG. 1—SET-UP FOR SLOTTING SHUTTLE RACES

In Fig. 1 there is shown a fixture set up in position for use on a Lincoln type milling machine. This fixture holds seven sewing machine parts, known as shuttle races, in each of which a slot $\frac{1}{8}$ in. wide by $\frac{7}{8}$ in deep is milled by feeding the parts into the cutters to a stop. The arbor of the machine is $1\frac{1}{4}$ in. in diameter and holds seven $\frac{1}{8}$ in. by $4\frac{1}{2}$ in. standard saws, separated by spacers of equal length. The center of the arbor is set slightly above the center of the slot which is to be milled. By revolving the cutters downward toward the work, the arbor is forced down upon the fixture and no clamping is necessary.

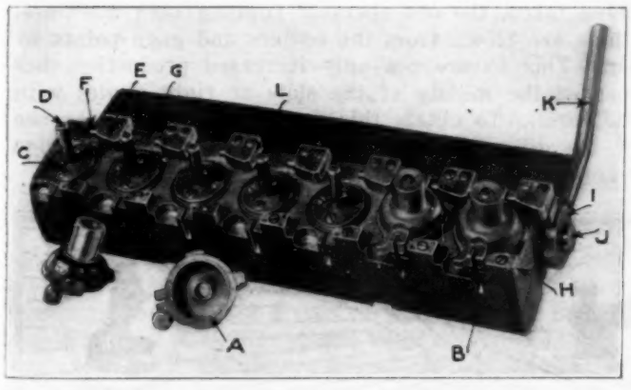


FIG. 2—THE SHUTTLE RACE FIXTURE

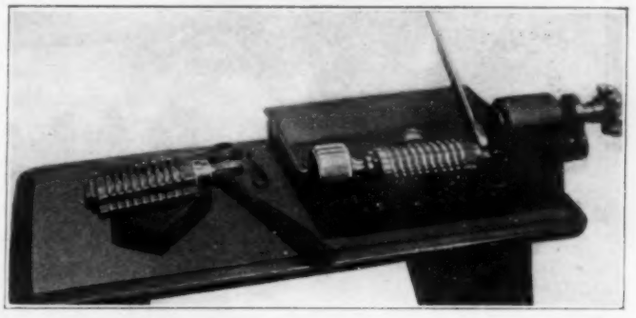


FIG. 3—LOADING THE SHUTTLE RACE COVER ARBOR

The details and method of operation of this fixture are given in Fig. 2. The work is shown at *A*. The body of the fixture, *B*, is made of cast iron and machined to receive the smaller parts. It will be noted that it has been machined at seven regular intervals along one side in the form of semi-circular slots in order to provide clearance for the button of the shuttle race *A*.

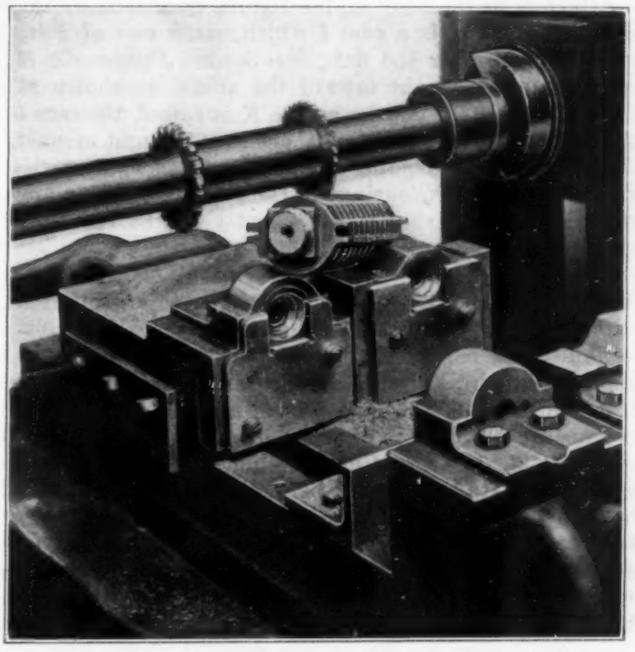
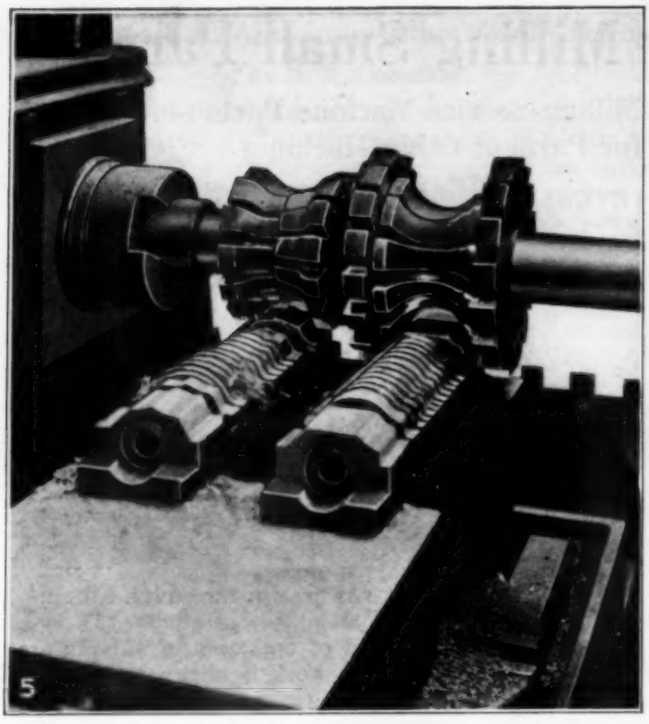
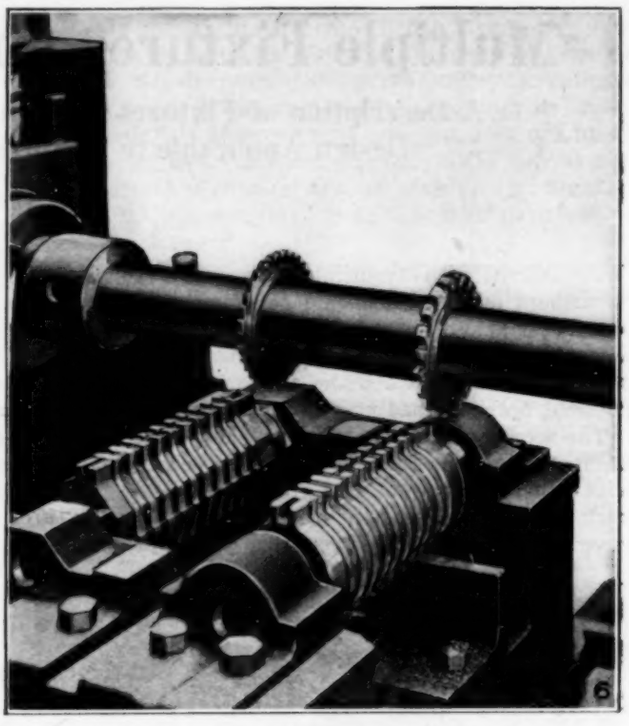


FIG. 4—THE VISES FOR HOLDING THE ARBORS

The plugs, *C*, are made of steel and turned to fit the bore of the shuttle race. At an angle of 15 deg., to suit the race, a hole is reamed in each of these plugs, after which, stems *D*, made of hardened drill rods, are driven into place. The plugs are then doweled into position on the fixture.

On the opposite side of the fixture, seven steel blocks *E* are fastened to the strip *G* by $\frac{1}{4}$-in. filister head screws. The position of this strip and the method of attachment to the body *B* is shown more clearly in Fig. 1. The steel blocks *E* contain shoulder pins, *F*, which are





FIGS. 5 AND 6—FORM MILLING AND SLOTTING OPERATIONS ON SHUTTLE RACE COVERS

backed up by coil springs held in the blocks by means of headless screws *L*.

Attached to the body of the fixture by means of the shoulder screw *J* is a cam *I* which has a rise of ¼ in. In operation, after the fixture is loaded, the handle *K* is raised and brought toward the arbor, as shown at the left of Fig. 1. As the handle *K* is raised, the cam *I* slides the strip *G*. The pins *F* are thus brought against the shuttle races, holding them in position against the gage blocks *H*. The springs in the blocks *E* take up any variations in the shuttle races and keep the cut from chattering.

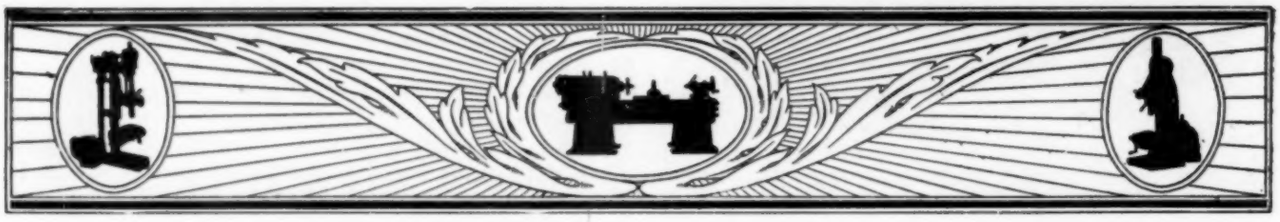
Before proceeding to the description of the other fixtures, it might be well to mention at this point that each shuttle race is fitted with a race cover which must be milled not only to form to fit the race *A*, but must also be slotted. For these operations the fixtures illustrated in Figs. 3, 4, 5, and 6 have been devised for use in two Lincoln type milling machines.

In Fig. 3, on a stand of convenient height, is shown a loading fixture. It will be noticed that each arbor holds ten race covers and nine spacers. These are held securely on the arbor by a locking washer and a ¾ in. nut. The locking washer, like the race covers, is milled to form. The arbors are loaded and placed in this fixture between centers. The nut is then tightened, the race covers resting on two parallel strips, one on each side, which locate the race covers on the arbors. The spacers have a small key which fits in a keyway on the arbors. This arrangement brings them always to the same position on the arbor.

In Fig. 4 a loaded arbor will be seen, as well as the vise for holding the two arbors. It will be noted that the arbors have a square on one end. This square is a snug fit in the gage plates on the loose jaw of the vise. Both jaws of the vise have a pair of bell centers which fit the centered end of the arbors. Having loaded the arbors, the first operation on the race covers is that of milling to form and to length as shown in Fig. 5.

Two arbors are placed in the vise and a cut is taken. As the two cutters are different in form, after the first cut is taken, the position of the arbors is reversed and a second cut is made. A newly loaded arbor is then put into the vise, leaving one of the arbors in for a second cut only. It will be seen that at each cut from this point onward, ten covers are completely formed and milled at each cut of the machine.

The next and last operation is illustrated in Fig. 6. Here is shown another view of the vise illustrated in Fig. 5 and also the method of setting up for milling two slots of different widths in these same covers. The procedure is identical with that just described. In the work of milling the race covers a total of five arbors are used. Four are in the two machines while a fifth arbor is unloaded and loaded by the operator while the cut is being taken, the one operator running both machines. Chips are blown from the centers and gage points by air. This fixture not only increased production, but insured the milling of the slots at right angles with the form. To obtain this result had always been one of the difficulties of the old method where the slots were milled one at a time.



Methods of Machine Tool Design

Continuing the Subject of Machine Tool Feed Mechanisms—Design of the Drum Cam Roller—Devices for Eliminating Lost Motion

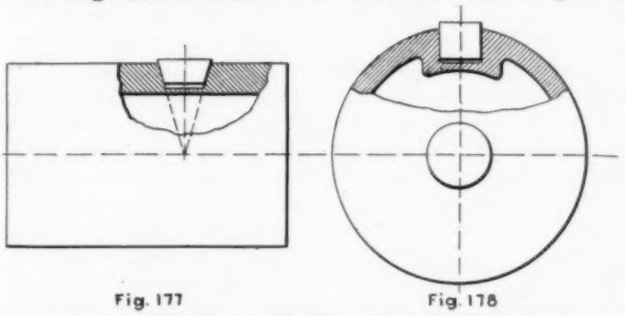
By A. L. DeLEEUW
Consulting Editor, *American Machinist*

THE roller used with a disk cam should be of cylindrical shape. Being of this shape it will always have a straight-line bearing on the cam and the length of this bearing will be equal to the thickness of the cam if the thickness of the roller is not less than that of the cam, which never should be the case. As to the diameter of the roller, this should be made as large as possible and it should run on a stud as small as possible so that it will be free to turn against the friction between roller and stud. On the other hand, if we make the diameter of the roller large we shall lose considerable time when the roller must pass over the point of the cam or anywhere where the curvature of the cam changes.

Our problem, then, is to select a roller which is large enough to turn freely and yet small enough so that no more time is lost than necessary. Though in one way it is advisable to make the diameter of the stud small, on the other hand, sufficient amount of surface must be retained so that there will not be excessive friction between roller and stud. Thus, the pressure per unit surface will not be so great that the lubricant is entirely squeezed out.

The problem of the cam roller when using a disk cam is not a very serious one as compared to what we meet when we use a drum cam. In Fig. 177 a drum cam and roller are shown in which the roller is made of conical shape. If we should consider that the left side of the cam groove is rubbing against the roller and if we imagine that the groove is at right angles to the axis (which is only the case when there is a dwell in the cam), then the action between roller and cam is the same as that between two friction rollers and their surfaces should be made like the pitch surfaces of a pair of bevel gears, which is the way they are shown in the illustration.

In Fig. 178 a cam drum is shown with a groove



FIGS. 177 AND 178—SECTIONS OF DRUM CAMS AND ROLLERS

running parallel to the axis, which can never be the case where the cam drives the roller, but which may happen when the roller drives the cam. In this case it is obvious that the roller should be of cylindrical shape.

In ordinary drum cams, parts of the groove may be as in Fig. 177 but the greater part will be at more or less of an angle with the axis. In that case neither the conical nor the cylindrical roller will give entire satisfaction. If in Fig. 177 we had used a cylindrical roller we would have had the following conditions:

Supposing the depth of the groove to be one-fourth of the radius of the drum, then the speed of a point at the top of the groove would have been 4, while the speed of a corresponding point at the bottom would have been 3. As all the points of the surface of a cylindrical roller run at the same speed, there must have been slippage between roller and cam. This slippage would soon wear a flat place on the roller which would prevent it from turning. As soon as this happens the wear would increase and the roller as such cease to function. In order to see what happens when the cam groove is at an angle with the axis, we will take a concrete example. Imagine a cam of which the groove has a depth equal to one-fourth of the radius and with an angle of spiral of 45 deg. When we speak of an angle of spiral in a case like this, we must indicate at which point of the depth of the groove we consider this angle to be, for the angles of spiral of top and bottom of the groove are not the same. In order to find the angle of spiral we would take the circumference of the drum at that point as the base of a triangle, the lead of the spiral as the other right-angle side, and the hypotenuse would show the angle of the spiral.

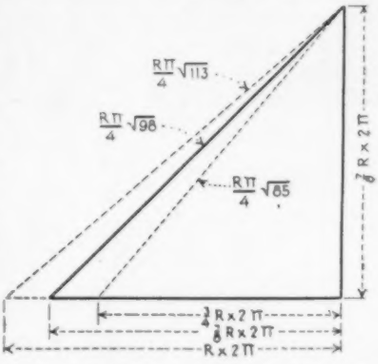


FIG. 179—DIAGRAM TO SHOW VARYING ANGLES OF SPIRAL AT DIFFERENT DEPTHS OF CAM GROOVE

The lead being the same at top, bottom or center of the groove, but the circumference at these points different, we will get different angles of spiral. As a rule, the angle of spiral is given for the center of the depth of the groove or, as it is sometimes called, at the pitch circle. However, there is no reason to give it this name, nor is there a good reason to base our calculations on the angle at that particular point. As a matter of fact, it is safer to consider the angle at the bottom of the groove because at that point the angle is steeper.

Such a triangle as was mentioned before is shown in Fig. 179. The full line triangle is the one we would obtain at the pitch point. As the outside radius is R and the depth of the groove is $\frac{1}{4}R$, the radius at the pitch point will be $\frac{7}{8}R$. The length of the hypotenuse is shown for top, bottom and center of cam groove and we see not only that they are different but also that the length of the hypotenuse at the pitch point is not

the mean between the other two lengths, so that even a conical roller could not engage this cam groove without slippage. This slippage, however, would be considerably less than it would be if we had made the roller cylindrical in form.

Of course it would be possible to construct a roller of such a contour that there is no slippage. In the case illustrated, the top, center and bottom diameter of the roller would have to be in ratio of $\sqrt{113}$; $\sqrt{98}$; $\sqrt{85}$. A number of other points could have been calculated or graphically determined and a roller could have been constructed which would not slip. If such a cam groove should go on without ever changing its direction or lead, such a roller would act without slippage. A cam groove must, however, necessarily return to its starting point, so that there will be a point somewhere where this same spiral is no longer used and therefore where there will be slippage between roller and cam.

If we should have a cam of which the groove goes around one-half the drum without changing its angle of spiral and if then it should at once return to its starting point with the same angle of spiral, we would have an ideal set of conditions so far as the action goes between cam and roller. Such a set of conditions, however, hardly ever occurs in practice. The ordinary cam will have part of its groove at one angle, other parts at another, still other parts running at right angles to the axis, etc., so that the only thing left for us to do is to make some compromise in regard to the shape of the roller. Where we know the exact functioning of a cam we can select that part of the groove where the hardest work is done or perhaps where the groove is of the steepest angle, possibly both, and make the roller conical and with an angle to suit this particular part of the groove. Even then, we should favor the top or larger diameter of the roller so as to have the slippage take place on the smaller part.

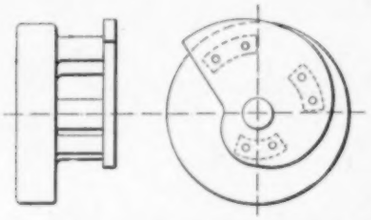


FIG. 180—METHOD OF ATTACHING FACE CAM TO GEAR

Where a cam may be used for different jobs and especially where a cam is built up for various jobs by attaching straps to a drum, so that we may be confronted with almost any angle, a practical solution of the problem would be to give the roller, which by the way is never changed no matter what the groove may be, the form of a cone with an angle corresponding to a strap angle of 30 deg. with the axis.

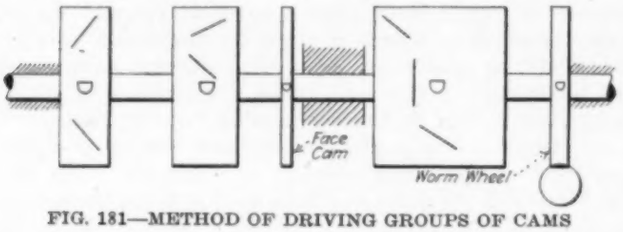


FIG. 181—METHOD OF DRIVING GROUPS OF CAMS

It is sometimes recommended to make the roller slightly barrel shape. This is a good solution where the work is very light but not where the work is of a heavy nature because the barrel-shaped roller provides only a single point of contact between roller and cam.

A single cam may be driven either by a shaft to which it is keyed or fastened in some way, or by a direct drive. Where the cam performs a light duty only, or where its movement does not need to be strictly uniform and without shocks, a shaft drive is acceptable. As a rule, a gear or a screw is loaded fairly uniformly and, if there are fluctuations, they are seldom sudden or periodical. A cam, on the other hand, has a non-uniform load, and, in the nature of things, the load is periodical; that is to say, the changes of load go through a definite cycle and recur in the same order for every revolution of the cam. If a gear is mounted at the end of a long shaft which is driven at the other end, there will be a certain amount of wind in the shaft which is zero at the moment we start to drive and which very soon comes to a maximum. From then on the amount of wind is either constant or changes only slightly and slowly. This is not always so but is true of the great majority of cases. If a cam should be mounted at the end of a long shaft of which the other end receives the driving gear, the amount of wind in the shaft would change with every change in the angularity of the cam and with every change of load. As a result, a cam would have a jerky motion and its action would lack uniformity. For this reason cams should not be mounted far from the source of driving power and, if it is not possible to avoid this, the shaft should be made very heavy so as to minimize the amount of wind.

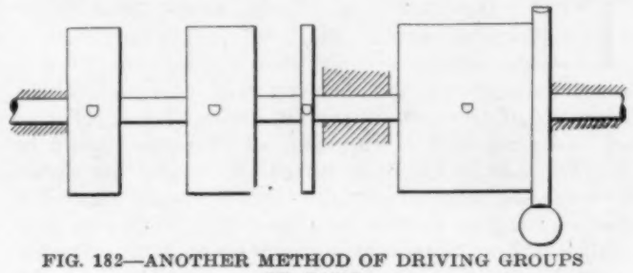


FIG. 182—ANOTHER METHOD OF DRIVING GROUPS OF CAMS

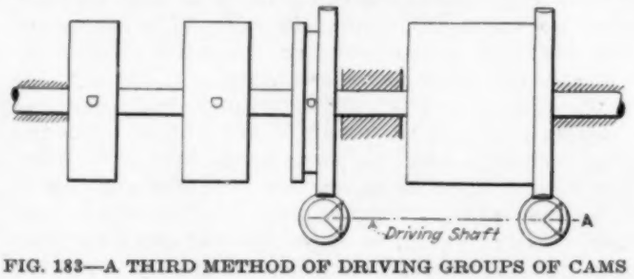


FIG. 183—A THIRD METHOD OF DRIVING GROUPS OF CAMS

The shaft drive is permissible for cams which perform secondary operations and where uniformity of action is not essential, as well as where the sudden jerky movement cannot affect the work. But for cams which are heavily loaded or which are called upon to produce accurate work, such as the main feed cams of automatic machines, a shaft drive is not permissible. In such cases the cams should be driven directly. This may be done by fastening a spur or bevel or internal or worm gear directly to the drum. Where a face cam must be driven and where it is not possible to fasten it directly to a gear because the roller might interfere, an element may be introduced between cam and gear to provide the necessary clearance. Fig. 180 shows the manner in which a face cam might be attached to a gear and provide sufficient clearance for roller or lever or whatever element might interfere. It is hardly necessary

to show how a drum cam can be fastened to a driving gear.

Not only should the cam be directly driven but the designer should see to it that the driving gear is large in diameter, if possible larger than the cam, and if not possible, as near the size of the cam as it can be made. In no case should it be much smaller than the cam.

When there are a number of cams in one machine it is customary to place as many of them as possible on a single shaft and either drive the shaft itself or else drive one of the cams, transmitting this drive through the shaft to the other cams. This is permissible when

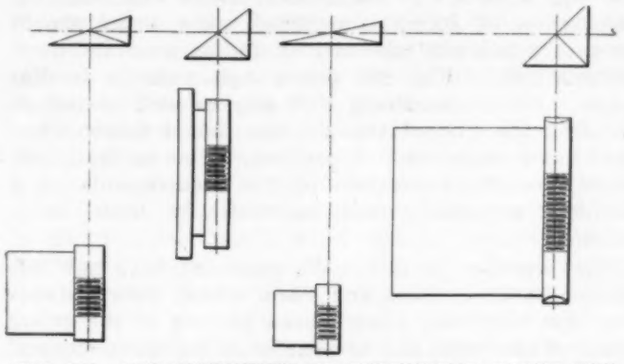


FIG. 184—ARRANGEMENTS OF INDIVIDUAL DRIVE FOR IMPORTANT ELEMENTS

none of the other cams are called upon to do heavy work. Here again we would have the shaft drive for all of the cams but one. When there is more than one cam in the machine which must have a steady motion, each of these cams should be driven separately by being attached to its own gear. This does not prevent them from being placed on the same shaft if this will lead to simplification of the construction.

Fig. 181 shows a number of cams all keyed to the same shaft which is driven at one end by means of a worm and worm wheel. Fig. 182 shows a somewhat better construction in which the drum cam is directly attached to this worm wheel, while the other cams are keyed to the shaft. In Fig. 183 is shown the same arrangement again but here it is supposed that the face cam also must have a smooth and uniform motion. It is keyed to the shaft, whereas the large drum cam is running loose on it. All the other cams are also keyed to the main shaft. The two important cams, the large drum cam and the face cam, are each provided with their own worm wheels and the worms are driven by sets of bevel gears which derive their power from shaft *A*. As the number of teeth of bevel

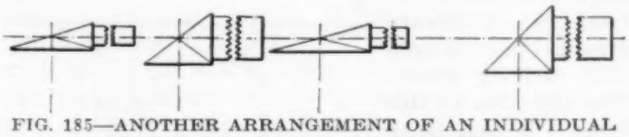


FIG. 185—ANOTHER ARRANGEMENT OF AN INDIVIDUAL DRIVE FOR IMPORTANT ELEMENTS

gears and worm wheels are the same for both cams, they will run in unison. As a consequence, though the drum cam is not keyed to it, it will not have any movement in relation to the shaft. We might have keyed the drum cam to the shaft, leaving the face cam loose, but with the arrangement of cams as shown in the sketch, this would have brought a larger part of the shaft in torsion than with the proposed arrangement. Generally speaking, that cam should be keyed to the shaft which is nearest to the secondary cam.

It might be asked why both cams are not keyed to the shaft. This should not be done because there is no absolute uniformity either between the two worm wheels or worms or the gears driving them. These little errors would cause one of the two cams to take the lead over the other at some point of the cycle, while at another point these conditions may be reversed. This would cause the very twist in the shaft which we aim to avoid.

In many automatic machines, particularly those constructed for some special purpose, one will find a number of slides or other elements carrying tools, all of which must have a smooth and uniform motion. In such a case, all of them should have their own individual drive. Fig. 184 shows such an arrangement. As will be seen, each cam has its own worm wheel but, as not all cams have the same size, it is not necessary to make all worm wheels of the same diameter. It is necessary that all cams should run at the same speed and make the same number of revolutions per minute. This may be accomplished by giving the sets of bevel gears used for the various cams different ratios. This is shown in Fig. 184.

Not only is such an arrangement correct because it gives the proper kind of drive to each of the cams but it is also a very elastic arrangement and can easily be designed in such a manner that any number of cams may be thrown out of action so that small cams may be used where otherwise large ones would be required. As a rule, a large proportion of all the cams used in such a machine is idle, thus requiring a large cam for a small field of action. By modifying the construction, as shown in Fig. 185, we obtain the condition by which small cams can be used, which lends itself to the construction of a program machine, and which permits of many changes of jobs without the necessity of revising the camming of the entire machine. A change of work might require the changing of a single cam with this arrangement, whereas with the ordinary arrangement a change or at least an analysis of all of the cams is necessary.

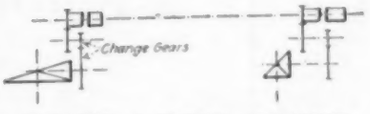


FIG. 186—A THIRD ARRANGEMENT OF AN INDIVIDUAL DRIVE FOR IMPORTANT ELEMENTS

A further improvement, which would make such a machine more universal, is shown in Fig. 186. In the arrangement of Fig. 185 all cams were supposed to run at the same speed. This, however, is not absolutely necessary. It would have been possible to select the bevel gears or worm gears so as to obtain different speeds for the various cams, thus giving each cam a cycle in keeping with the work it has to do. When the machine is once arranged, the relative length of these cycles cannot be changed. It would be possible to speed up or slow down all of the cams but not to change their relative speed. This condition is improved by the arrangement shown in Fig. 186 where each cam may be driven at any speed within a certain range by change gears. It should be noted that such an arrangement permits the running of all cams at the same time, or each cam separately, or any combination. A machine built with such a system of cams may be considered as a group of machines which are only connected by a common source of driving power, by a common feed shaft, and by a common system of control.

Mention was made of the fact that a shaft drive is

not desirable on account of the jerky motion due to wind or twist of the shaft. There is another item which affects the smooth and even motion of the cam and that is the fact that in a drum cam the roller can never completely fit the groove; in other words, that we have lost motion. This lost motion becomes especially visible when the direction of the cam changes, for instance, when it goes over from feed to return, or vice versa. It also becomes visible when the cam changes from slow to fast, or vice versa. This is so well recog-

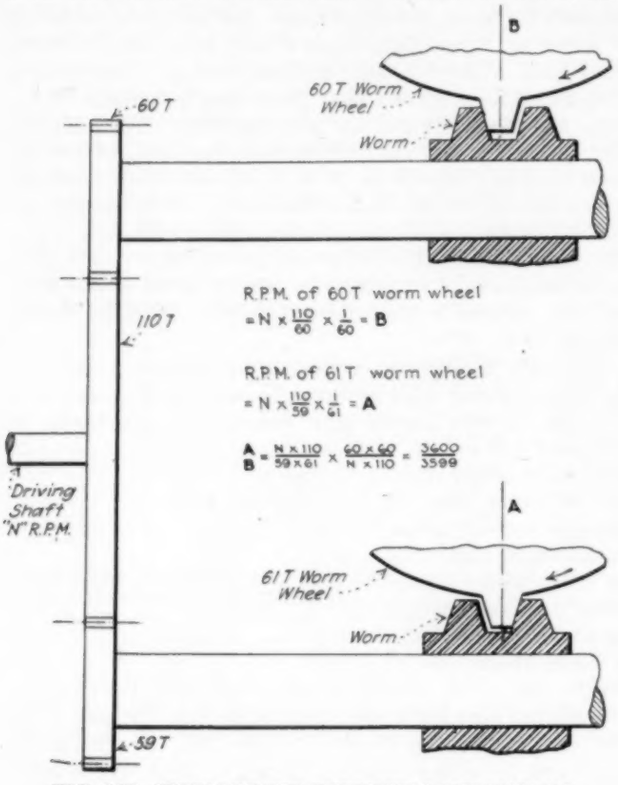

B
60 T Worm Wheel
60 T
Worm
R.P.M. of 60 T worm wheel
= N × 110/60 × 1/60 = B
110 T
R.P.M. of 61 T worm wheel
= N × 110/59 × 1/61 = A
A/B = N × 110/59 × 61 × 60 × 60/N × 110 = 3600/3599
Driving Shaft "N" R.P.M.
A
61 T Worm Wheel
Worm
59 T

FIG. 187—WORM DRIVE WITHOUT LOST MOTION

nized that it is customary to put a guard strip on a drum cam opposite the acting cam strip. A rapid advance of a turret slide, for instance, may involve so much momentum of the sliding parts that the turret would go entirely too far and the tools might smash into the work if there were no such guard strip. In the great majority of cases such a guard strip is all that is required to counteract the effects of lost motion. There are cases, however, where much greater smoothness of action is required than can be obtained by this means. In such cases springs or weights may be used to hold the roller against the active side of the cam whether this be a drum cam or a face cam.

When all this is done, there still remains another source of lost motion which, as a rule, does not need to be considered seriously, but which, in a few instances, should be taken care of. We refer to the lost motion between worm and worm wheel or between pinion and gear driving the cam. In cases where a particularly smooth motion is required, nothing but a worm and worm wheel would be considered fit for the drive, so that we need to look at this kind of gearing only when we consider how to overcome whatever lost motion there may be left.

There are, of course, a number of ways in which the lost motion between a worm and worm wheel is supposed to be taken up. The worm may be brought deeper into mesh or the worm wheel may be made in two halves bolted together and so arranged that one half can be shifted a slight amount in relation to the other half, or the worm may be made on a taper so that it can be brought deeper into mesh by being moved in an axial direction. None of these methods overcomes entirely the lost motion because they all take for granted that the wear in worm and worm wheel has been even. This is never entirely the case and certainly not with a cam drive, because the pressure required at various points of the cam is not alike and the wear on the worm wheel cannot be expected to be even all the way around. In such cases, where extraordinary smoothness of action is required, some device should be used which will take care of uneven wear and do it automatically. Fig. 187 shows such a device in diagram. Before describing it it may be well to analyze it along the line of thought one should follow when confronted with such a problem. The analysis will show how the realization of the requirements of a problem necessarily and automatically leads to a solution.

The situation is this: We must not have any lost motion between worm and worm wheel, notwithstanding that both may have uneven spacing of the active sides of the teeth, due to wear or to initial inaccuracy. The natural solution is to prevent the worm wheel from moving backward, meanwhile permitting it to go forward. This might be done by wrapping a rope around the hub of the wheel and attaching thereto a weight heavy enough to prevent the wheel from rebounding whatever may be its tendency to do so. This solution is not practical if the machine must run all the time because the length of the rope is necessarily limited. Such a device *might* be useful if the machine were to make only one or two turns. In that case we would wrap the rope around a drum which can be fastened to the worm wheel. When the machine has made its specified number of turns we would unclamp the drum from the wheel, re-wind the rope on the drum, and fasten this once more to the wheel and then resume operations. For the continuous operation of the machine some other device must be designed.

Another means to prevent backward movement and which suggests itself at once, is friction. If sufficient friction is brought to bear against the wheel there will be no possibility of such backward movement and at the same time it will not prevent the wheel from going forward provided there is sufficient driving power. The objection to this scheme is that much power is lost and that this lost power causes wear of the parts, besides making it necessary to proportion all driving parts on a much larger scale. We would have to double the pressure against the worm wheel and lose at least 50 per cent of the power. This seems to condemn the scheme until we remember that the friction member does not need to be stationary but may revolve as well as the worm wheel. The only requirement we must meet is that this friction member

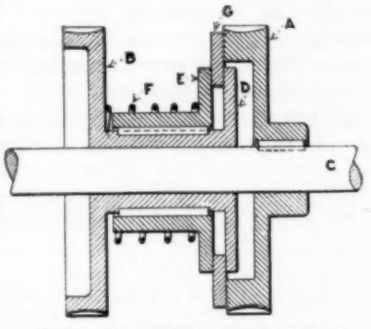


FIG. 188—SKETCH TO SHOW PRINCIPLE OF FRICTION RETARDED WORM

should run somewhat slower than the worm wheel. The difference in speed may be very small because the unevennesses in worm and worm wheel which cause the lost motion are never more than a few thousandths of an inch. This suggests the use of two worm wheels, one fastened to the spindle (or whatever device must be driven), and the other containing the friction device, which will prevent the backward motion.

Fig. 187 shows how such a device would work. *A* is the acting, and *B* the retarding worm wheel. A tooth of *A* will bear against the left side of a tooth of its worm, if the drive is in the direction of the arrow. *A* will take *B* along by friction and will make a tooth of *B* bear against the right-hand side of a tooth of its worm, if this worm stands still or, speaking in a more general way, so long as this worm turns slower than it should to give *B* the same speed as *A*

This leads to the construction shown in Fig. 188. *A* is the acting worm wheel which is shown here as being keyed to a shaft. It might as well be fastened to a spindle or a cam drum or to any other member. *B* is the retarding worm wheel which is fastened to a sleeve provided with a friction plate *D*. Keyed to this sleeve in such a way that it can slide thereon is the friction plate *E*. The spring *F* clamps the plate *G* between *D* and *E*. This plate *G* is fastened to worm wheel *A*, so that this latter wheel will have a tendency to take *B* along but is prevented from doing so by the fact that the worm which drives *B* does not permit it to run as fast as *A*. Instead of a single spring a number of springs might be employed and, instead of a single plate *G*, the contrivance which is, in effect, nothing more than a friction clutch, might be made of the multiple-disk type. One thing should be kept in mind, and that is that the unit pressure between plates must be kept low to avoid abrasion. Attention is called to the fact that Fig. 188 does not show a practical construction but merely the principle of this device.

To avoid undue loss of power by friction and the resulting wear and other undesirable features, we should keep the difference in speed between *A* and *B* to a very small amount. Both wheels being worm wheels we would accomplish this by giving *B* one tooth more than *A;* but even this difference in speed is much more than what is required to make up for the slight errors there may be in the worms and worm wheels. We should arrange the drive so that when *B* makes a large number of revolutions, *A* makes one revolution more. For instance, we might have *B* running 1,000 and *A* 1,001 revolutions in the same time. We see at once that this cannot be accomplished merely by the difference in teeth of the two worm wheels and we will have to employ some other gears. If we introduce one additional gear ratio both systems *A* and *B* will have a speed depending on the product of two gear ratios. The simplest arrangement would be to place a spur gear on each of the two worms and drive them each by means of another gear. If worm wheel *B* has *P* teeth and the number of teeth of *A* is *Q*, and if we place on the worms spur gears with *R* and *S* teeth respectively and drive them both by means of a common gear with *T* teeth, we will find that when the last-mentioned gears runs *N* revolutions *B* runs $\frac{T}{R} \times \frac{N}{P}$ revolutions; and *A* runs $\frac{T}{S} \times \frac{N}{Q}$ revolutions so that the speeds of *B* and *A* bear the proportion $\frac{T}{R} \times \frac{N}{P}$ to $\frac{T}{S} \times \frac{N}{Q}$ or as *QS* to *PR*.

We must find, then, two products both large and differing very little. As all the factors of these products are integer numbers (because they represent the number of teeth of gears), the smallest difference we can have is 1. We might construct all kinds of products which differ 1, such, for instance, as 1,000 and 1,001, the first one being the product of, say, 25 and 40; and the latter of, say, 13 and 77. We wish to have the numbers of teeth of the worm wheels close together and we happen to remember that a square as well as a square minus one can always be factored. For instance, we might choose 2,500 and 2,499, the first one being the product of 50 and 50, and the latter of 51 and 49. Fig. 187 shows *B* with 60 teeth, *A* with 61, while the worms are driven by gears of 60 and 59 teeth respectively. Thus the speed ratio of the two wheels is as 60×60 to 59×61. In other words, *B* will make 3,599 revolutions while *A* makes 3,600, and the work lost by friction is due to one revolution in 3,600. Any other combination might be made and might even be more desirable according to circumstances. It should be noted that the common driving spur gear is shown here to have 110 teeth. This number, however, is entirely immaterial and has no effect on the final ratio.

Attention was called to some arrangements of cams by which some of the secondary operations were performed by a cam which made one-half or one revolution by the application of a single-revolution clutch. This is in principle nothing else but an application of small cams individually driven. In our discussion of such cams we imagined them to perform rather lengthy operation and doing this while the other cams were standing still. There may be many operations in automatic machines which require a very small amount of time, so that their cams can be directly attached to a rather fast-running shaft. The total time occupied by the operation of such cams may be but a very small percentage of the time required for the complete cycle, so that it is hardly worth while to interrupt all the other operations while this particular operation takes place. An instance of this kind is the Brown & Sharpe automatic screw machine where such operations as the shifting of belts, opening and closing of chuck, and stock feed are performed by the single-revolution clutch while the main cam keeps moving.

The action of the cam should be transmitted to the member which is to be moved by the most direct method possible; that is to say, either the cam or the roller should be attached directly to that member. As a rule, it is the roller which is thus attached, but it may just as well be the cam. An instance of this latter construction may be found in the Cleveland automatic screw machine where the cam moves together with the turret. In most other screw machines the cam is held in a fixed position and the roller is attached to the moving part. However, there is no reason why one construction should be selected above the other, except for some advantage to be gained apart from the merits of the transmission itself.

In many machines in which cams are used, in fact it may be said in most machines, there is some intermediary member between cam and the part to be moved, a lever, or slide, or possibly a combination of both. In a great many machines such a construction is not objectionable but in machine tools where it is essential to avoid as much as possible all sources of weakness, all sources of deflection or spring, and where it is desirable to have the tool slides or work-holding members move

with the greatest possible uniformity and smoothness of action, all intermediary members of this nature should be avoided. This rule does not apply when the member to be moved does not perform primary duties, such as guiding a tool or controlling work. Where it is used for trips, the placing in position of stops (but not the accurate location of stops), for closing chucks, feeding stock, etc., we really have the same conditions as we find in automatic machines outside of the machine-tool class and intermediary members are permissible.

Where the conditions of the machine seem to make it unavoidable to use such intermediary members, they should be made exceedingly heavy. The lever should be made with heavy arms and very large bearing for fulcrum, with heavy connections, in fact, everything calculated to minimize deflection, twist, and lost motion; and wherever possible a take-up for wear should be provided. We say "When it *seems* impossible" to avoid such a construction; because it is very seldom indeed that the designer cannot entirely avoid it if he has made up his mind to do so and if he is not afraid to bring a portion of his gray matter into action.

Apprenticeship, Old-Fashioned and Modern

By John S. Watts

Observation of the results of the modern type of apprentice training departments leads me to the conclusion that some of the methods used in training apprentices, while highly efficient in turning out young mechanics who can execute good work of a character with which their teachers have made them familiar, are not as successful as the older ways were in making mechanics who could think out for themselves the solution of some new problem.

The apprentice in an apprentice training department today is taught by doing a job under the direct supervision of his superior who teaches him by showing him in detail just how to proceed step by step, until by practice he is able to execute the job. Sometimes alternative methods of doing the same job may be spoken of, and reasons given for using the method taught; but even if this is done the apprentice in his effort to execute the work in the particular way shown him is not likely to remember much of anything that has been said that did not bear directly on the operation as he was being taught to perform it. In effect this method of tuition is really more a matter of drilling, using the word in its military sense, than it is of educating, and in this to my mind lies its weak point. Because it forms in the mind of the apprentice a habit of depending upon someone to show him how to handle any new jobs, whereas real education means the training of the ability to solve one's own problems by a process of reasoning based upon data observed or previously learned.

There can be no doubt that a long continued course of tuition under the method of teaching by detailed demonstration, will sap the students powers of independent reasoning, because of the lack of exercise of this power, until in the end he becomes unable to attack a job with which he is not familiar without someone to show him the correct procedure. Time and again have I known this class of men to ask for information from pure habit, while at the same time they had in themselves all the knowledge that was required. They lacked the ability to apply this knowledge to a different problem, or it might in some cases be more correct to say that they had not cultivated a confidence in their ability to reason from known facts.

In those ancient days when I served my apprenticeship, there was no such animal as an apprentice instructor, and it seems to me now that the general idea was that if a boy worked for four or five years in a machine shop, he would become a machinist if he was fitted for it, by the mere working with mechanics and breathing the atmosphere of a machine shop. Certainly there was no manner of method used to train or educate him, and if he failed to become a skilled mechanic in that period of time the fault was deemed to be in himself, in that he was not capable of becoming one.

For the benefit of the younger men, I may say that the general routine of an apprenticeship in those days, that is, up to about twenty-five years ago, was that during the first six months practically the whole time of the apprentice was spent in running errands, carrying tools, and cleaning up the machines. Whenever it happened that a new apprentice was taken on, the older one was "promoted" to assisting the journeymen on the heavier machines, with an occasional very simple job to do on his own. Even when the apprentice was given a job to do, he was merely told what was wanted and expected to go ahead and do it entirely on his own initiative.

As he struggled along he gradually became aware that everyone in the shop was keeping an amused eye upon him, and an attack of stage fright was added to his other troubles. If the youngster showed the mettle that was in him and really tried his best, exhibiting a reasonable amount of intelligence in tackling the job, allowing for his inexperience, some one or other of the men would give him a hint in passing to put him on the right road. But if the boy had been stuck up, a snob, or otherwise displayed obnoxious tendencies in the shop, or did not handle himself as well as his previous opportunities of observing other men's work should have enabled him to, woe betide him, as he would be allowed to go his own way even to the destruction of the machine.

Granted that this way was a cruel, hard and slow one, still the youngster when he finally got the job done had found out himself how to do it, and had also learned by actual experience what troubles to look out for and what should be done to avoid them. Moreover having discovered this information by the sweat of his brow, he was little likely to forget it. We all know that knowledge gained by personal effort becomes a part of ourselves, unlike that imparted to us by others, which is apt to be forgotten, and in any case is not so thoroughly well understood. Incidentally the repetition of this struggle with each new job, forms an excellent training for the character, leading as it does to an increase in the eminently useful virtues of self-reliance without conceit, of reasoning and foresight.

My purpose in writing this is not to advocate a return to the old system, but to suggest that the new apprentice training schools, while undoubtedly efficient in turning out trained mechanics in a short period of tuition, are not as efficient as the old way in making all-around workmen who could turn their hand to any job within their trade. My point is that it would be better to take a little longer to educate the boys, instead of training them to a parrot-like ability to repeat what they have seen done.

The New Tariff Act

Significance of Elastic Sections—Their Effect on Exports and Imports—Changed Status of Tariff Commission

By R. B. ROSS
Associate Editor, *American Machinist*

THE tariff controversy—will it ever end? Small wonder is it that the American business man has asked this question so many times within the past eighteen months or more. The daily press, the weekly and monthly periodicals, the trade journals—all have staggered under a heavy burden of widely divergent views and comment.

Even today with the bill passed and spread upon the statute books, the average citizen, emerging from the bewildering maze of partisan or sectional argument pro and con, wonders what good, if any, has been accomplished. It is with difficulty, if at all, that he has been able to discover what improvements have been made, how far reaching they are, and what their effect will be if carried out in a broad spirit of equity and justice.

Divesting the bill as passed of any partisan aspect; disregarding whatever charge may be set up that special interests have been favored; and leaving out of the discussion the question of the soundness for the basis of the rates and their effect on living costs, it is, perhaps, worth while to examine the document as a whole. What new features does it contain? Do they, or do they not, mark progress? What new powers have been prescribed, in whom are they vested and what new organization and method of procedure has been provided for?

Gives President Broad Powers

Briefly, in the new tariff act there are three outstanding provisions which are new and which mark a distinct advance in tariff legislation. These three provisions are contained in Sections 315, 316 and 317 of Title III of the act, which covers special provisions. It was these sections that President Harding had in mind when, at the time of his signing the bill he said, "If we succeed as I hope we shall succeed, in making effective the elastic provisions of this bill, this will prove the greatest contribution toward progress in tariff making in a century."

The first of these new provisions, Section 315, has come to be known as the flexible or elastic tariff section. Under it the President has been vested with powers which are almost plenary in character. He is vested with power to change the classification of any article or commodity set forth in the act. He is vested with power to substitute American for foreign valuation in the case of articles which are made subject to *ad valorem* duties. He is vested with power to raise or lower the duty on any article or commodity in an amount not to exceed 50 per cent of the rates specified elsewhere in the act. All this, however, is dependent upon recommendations made to the President by the Tariff Commission. At this point it is interesting to note the enlarged scope of the work of that body.

Under Section 315, and, for that matter, under Sections 316 and 317 also, an application or petition for action or relief may be made by any person, partnership, corporation or association. If the application be made and found in order, and if it disclose to the satisfaction of the Commission that there are good and sufficient reasons for requesting action or relief from existing duties, the Commission may then order an investigation. In this investigation, it is not compelled to confine itself to the issues presented but may broaden, limit or modify the issue as it sees fit. What it will seek chiefly to determine, however, regarding the article or commodity in question, is, to use the words of the act, "the difference in cost of production in the United States and the principal competing country."

If, upon the completion of such investigation it shall be found that an increase or a decrease in the duty fixed under Title I of the act is necessary to equalize the difference in cost of production, the Commission makes its recommendation to the President who is vested, as before stated, with power to take the necessary action.

May Substitute Foreign Valuation

In the case of articles subject to *ad valorem* duties it may be shown upon investigation by the Commission that an increase or a decrease of 50 per cent in the rate will not be sufficient to equalize the difference in production costs. It is then that the President may exercise his power and substitute American for foreign valuation.

The second of the new provisions, Section 316, has to do in the main with goods imported into the United States. It is framed chiefly to provide American industry with a weapon against unfair acts and methods employed by a competing country. In the words of the section, "unfair methods of competition and unfair acts in the importation of articles into the United States or in their sale by the owner, importer, consignee or agent of either, the tendency of which is to destroy or substantially injure an industry . . . shall be declared unlawful."

Protection for Export Trade

Here, again, the Tariff Commission functions to assist the President in making any decisions under this section, in that it is authorized to investigate any alleged violations. If it shall be found by that body that unfair methods are being employed, the President is vested with power to impose additional duty in an amount sufficient to offset such unfair practices. In no case, however, shall such additional duty exceed 50 per cent nor be less than 10 per cent.

The third and last of the new provisions, Section 317, is designed as a measure of protection for American export trade. It may be regarded as the logical outgrowth of the expansion which has taken place in the foreign commerce of the United States in the last decade. Within that period, as is well known, the volume of American exports has increased greatly. Not only has the volume increased but the classes and varieties have broadened. Within this period also, numerous American industries have become dependent to a greater or less degree on other lands for their raw materials vital to the existence of these industries.

It is natural, therefore, that with this great economic change there should come not merely a need but a demand for a more definite, a more stable and a more scientific tariff policy. In formulating Section 317 there has been a reversion to the Tariff Act of 1909 with its maximum and minimum features, and a discarding of the reciprocity policies and penalty duties which marked the McKinley and Dingley bills of the past. The section, however, has been broadened and given increased flexibility.

May Declare Additional Duties

As it now stands, the President is vested with power, "when he finds that the public interest shall be served thereby," to "declare new and additional duties upon articles wholly or in part the growth or product of any foreign country," whenever it shall be found, upon investigation, that such country has granted special favors to the products of a third country, thereby placing American products at a disadvantage in that market. Under this section the President may go even farther. Where it has been found that discrimination has been made against American goods or where, in fact, American goods are not fully accorded equal rights with those of another country, the President may prohibit entirely importations into the United States from the country resorting to such practices.

In one other particular is Section 317 of importance. It provides against preferential export taxes. It vests the President with power to penalize imports into the United States from a foreign country when and where it has been found, upon investigation, that that foreign country has been granted preferential export taxes by a third country.

As a result of these three provisions, Sections 315, 316 and 317, of the new act, a radical change has been made necessary in the organization of the United States Tariff Commission. More particularly under Section 315 is provision made for new and enlarged powers for the commission. Not only does the act provide at this point for issuance by the President of any and all proclamations changing rates or classifications, but it specifically states that investigations to assist the President in ascertaining the points at issue shall be made by the United States Tariff Commission. It also states that "no proclamation shall be issued under this section until such investigation shall have been made."

As far as the Tariff Commission itself is concerned, Section 315 provides for public hearings by that body at which it shall give reasonable opportunity to parties interested to be heard. As a final step in carrying out the details of the procedure, the act authorizes the commission to adopt such reasonable procedure, rules and regulations as it may deem necessary.

Tariff Commission Procedure

Under the executive order issued by the President, Oct. 7, the commission has taken the steps necessary to comply with the act and has issued its rules of procedure governing all applications for investigation and the routine to be followed: It has also organized itself into four main divisions as follows: 1, office of the chief investigator; 2, office of the chief economist; 3, legal division; and 4, secretary of the commission. The chief matter of interest in the organization of the commission is found in the joint offices of the chief investigator and the chief economist. Under the direction of these two chiefs will be eleven subdivisions, each with a chief and several experts in the respective lines as follows: Chemicals, pottery and glass, metals, wood and paper, sugar, agriculture, textiles, leather, sundries, preferential tariffs and commercial treaties, and accounting. It has also provided for the establishment of an office at the port of New York and various arrangements will be made for conducting investigations on the ground in the countries abroad.

On the whole, the new provisions of the Tariff Act of 1922 have created a situation which is certain to be watched with keen interest. The commission has before it a task the size of which it is idle to minimize. Not only will the nation be interested from now on in the manner and method in which it conducts its investigations, but it is certain to scrutinize minutely its every action with respect to the duties levied against the articles and commodities in the fifteen schedules of Title I, now being subjected to much adverse criticism from every quarter.

Are Metal Workers Hidebound? —Discussion

By Alfred Herbert, Ltd.
Coventry, England

The editorial under the above heading which appeared on page 154, Vol. 57 of the *American Machinist* strikes a note which we think is particularly opportune. There is no doubt that the important subject of metal cutting has not received the attention to which it is entitled through its importance as a power user. We ourselves have gone some little way by experiments in connection with tool grinding machines of our manufacture but the subject is such a vast one that we find it impossible to carry out the necessary research and experimental work that it demands.

We do not think that anyone will dispute the statement that for any one metal cutting operation there is one tool which will give the most efficient results, i.e., remove metal at the fastest possible rate with a minimum expenditure of power, but what that tool is there are as many opinions as there are people engaged in metal cutting. It is possible that Professor Coker in his research work, some account of which was given for the Institute of Mechanical Engineers a short time ago, is working on lines which may lead to good results in this direction some time or other, but we would like to suggest that some influential body, such as the Institution of Mechanical Engineers or the National Physical Laboratory, should undertake research work in connection with metal cutting tools in the most thorough way possible.

As an instance of what is possible in this direction, Messrs. Clark & Chapman of Gateshead a few years ago changed over the majority of their lathe tools from the ordinary type to a curved top face type. While they cannot give any definite data on power consumption, they state quite definitely that the amount of power absorbed in their machine shop was reduced by the change. If it is assumed that any one machine at any one operation absorbs say 1 hp., which by change of tool could be reduced to 0.9 hp., such reduction multiplied by the number of machines in this country would very soon show such an enormous saving in power that any research work in this direction would be amply justified.

An Interesting Rack and Gear Movement

The Gear Runs into and out of Mesh with Rack Twice in Each Cycle—While out of Mesh It Acts as a Crank

BY MILTON WRIGHT

AN INTERESTING and somewhat complicated gear and rack movement is that used to reciprocate the "bed" or platen of the Premier printing press made by the Premier & Potter Printing Press Manufacturing Co., Derby, Conn.

The Premier is what is technically known as a "flat-bed" press. The forms of type are locked in position

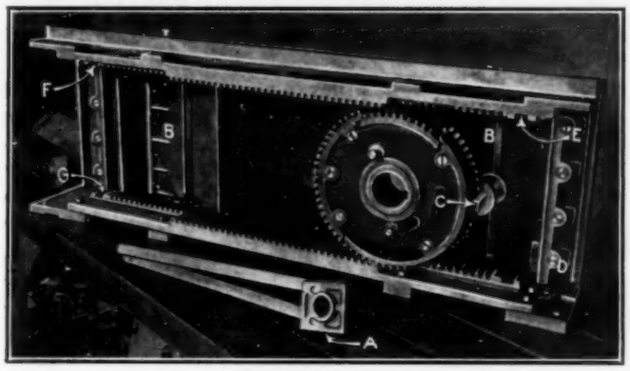


FIG. 1. GEAR AND RACK OF THE PREMIER PRINTING PRESS

on a flat table and caused to pass to and fro under a rotating cylinder that carries the paper upon which the impression is to be made. The cylinder is of such diameter that its circumference matches the length of the bed movement; its peripheral speed, therefore, being exactly the same as the speed at which the type is moving. Any deviation from a true relation in this respect would result in what the printers call "slurring" or smudging the impression.

The cylinder makes two revoltuions for each cycle of movement of the bed; being lifted by cams out of contact with the type as the bed passes back under it to the starting point. The cylinder and bed are not geared directly together and there is no hesitation in the rotative movement of the cylinder, so that it becomes a rather nice mechanical problem to deliver the bed to the swiftly moving cylinder at exactly the right time, place and speed at the beginning of each cycle, and to hold the bed and cylinder together during the entire forward movement as rigidly as if both were stationary.

Not only does this duty devolve upon the parts shown in Fig. 1, but the gear must also shoulder the responsibility of the practically instantaneous reversal of movement of half a ton of metal, and do it without undue shock or jar, twice in each cycle. When it is considered that there are nearly one hundred such reversals each minute an idea may be gained of the nicety with which these parts must function.

The rectangular frame in Fig. 1 is bolted to the under side of the bed and becomes a part of it. For convenience in photographing, the frame is shown upside down in the picture, but as it is entirely symmetrical, with the exception of the pads for the attaching bolts, that condition will make no difference whatever in the relative position of the parts shown, and it may be assumed that its position in the press is the same as in the picture.

The shaft upon the end of which the gear is keyed has no movement other than a rotative one, but, strange as it may seem, it turns *three* times for each cycle or passage of the bed back and forth.

The rack teeth at both top and bottom of the frame are rigid with respect to the latter; being in fact cut from the solid metal of which the frame is built up. The vertical distance between the pitch lines of the two racks is exactly the same as the pitch diameter of the gear, so that were it not for the peculiarities of the latter and the fact that each rack is composed of three sections lying in two different planes widthwise, the gear would be engaged with both racks at once and locked against movement.

Let us first study the gear, both sides of which are shown in Figs. 2 and 3, and the parts disassembled in Fig. 4. From these pictures it will be seen that the gear is twice as wide as the rack; being equal in fact to the combined width of the offset sections. We will note further that for one third of the circumference the teeth extend only half-way across from what we will call the front, (Fig. 2), on another third the teeth extend halfway across from the back, (Fig. 3); while for the remaining third, composed of the two ends of the sliding segment, the teeth extend the full width of the gear.

The sliding segment can be seen to advantage in Fig.

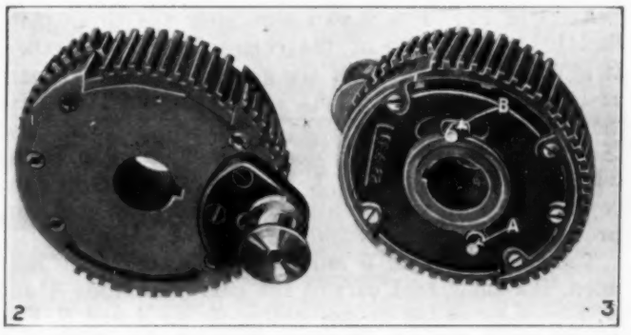


FIG. 2. CRANK SIDE OF GEAR. FIG. 3. COVER SIDE OF GEAR

4, where the cover and the actuating cam are removed. Each end of the segment is a true arc and the teeth cut thereon conform in every respect to those cut from the solid metal of the gear, but the segment itself is shorter than the diameter of the gear by an amount equal to the full depth of a tooth.

The gear as a matter of fact is cut, after assembly, upon an automatic gear cutter in the same manner that an ordinary gear would be cut; the only difference being that at some time after one end of the segment has been cut and before the machine has spaced around far enough to begin on the other end, the operator must happen around and shift the cam that moves the segment from one position to the other. He must also

cause the machine to skip a tooth at a predetermined point, as will be discerned later.

At *AA* (Fig. 4) upon the segment are hardened steel rollers upon which bear the risers *BB* of the actuating cam. The cam itself fits over the hub of the gear with the risers in contact with the rollers. It will be noted that the risers are opposed to each other so that a slight rotative movement of the cam in, let us say, the clock-wise direction will push the segment to the lower position as viewed in Figs. 2 and 4. The lower roller will then be resting on the dwell at the high spot of the cam while the upper roller is at the bottom of the corresponding rise. It is evident that a reverse movement of the cam would send the segment to the opposite position.

The forward and back movement of the cam must be

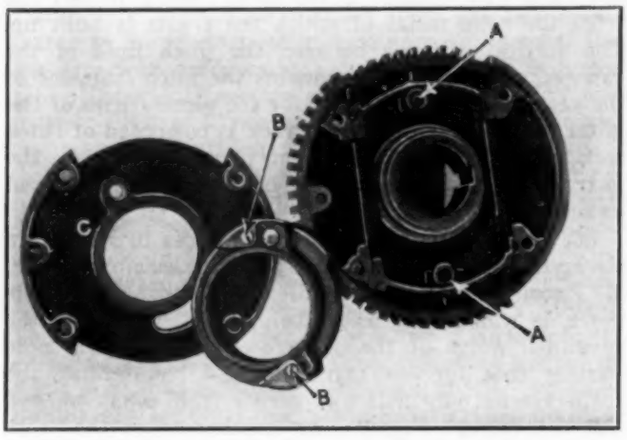


FIG. 4. THE GEAR PARTLY DISASSEMBLED

made twice in each three revolutions of the gear, and to produce such a movement within the constantly rotating gear is not altogether easy of accomplishment. The lever shown in Fig. 5 does the trick.

At *C* in Fig. 4 is shown separately the cover plate that holds the parts of the composite gear together. It is bolted to the body of the gear and becomes a part of it, confining the cam and segment against sidewise movement while allowing the one freely to rotate and the other to slide. A projecting stud, seen to better advantage at *A* in Fig. 3, is driven solidly into the cover plate. A similar stud *B*, driven into the cam, protrudes through the curved slot in the cover.

The lever in Fig. 5 surrounds, but does not bear upon, the shaft that carries the gear, the studs *A* and *B*, Fig. 3, enter the bronze sliding-blocks *A* and *B*, Fig. 5, which are free to move radially in their yokes. The yokes are a part of the ring *C*, which is fitted to turn freely in the shell of the lever. It will be seen, then, that at certain positions in the revolution of the gear, a movement applied at the end of the lever will produce a corresponding but much reduced movement of one or other of the two sliding blocks, while at other positions no movement would result.

The lever is, therefore, alternately of the first and the second class, power always being applied at the end of the lever, the fixed stud being always the fulcrum, and the stud in the cam always the weight to be moved. The fulcrum and the weight to be moved are, however, constantly exchanging positions as the gear and the ring *C* revolve together.

The lever does not at any time move the cam backwards. At certain points in the rotation the cam is moved forward faster than the gear would carry it; at other points it is merely retarded, allowing the gear to run away from it.

The gear is not at all times a gear. One revolution out of every three it is a crank and at these points (one-half revolution at each end of the traverse movement of the bed) it is entirely out of mesh with the rack and has the bed under control of a rigid crank connection by means of which it is enabled to slow down and stop the rapidly moving bed and accelerate it in reverse direction without the slam that otherwise would wreck the machinery at the first reversal. This brings us to the consideration of the complete movement as shown in Fig. 1.

When the press is fully assembled the bronze bearing block *A*, Fig. 1, is permanently located on the crankpin, which may be seen projecting from behind the gear and is held thereon by the removable flange on the end of the pin. The two rods shown attached to the block are attached at their other ends to a free slide and have no other function than to keep the block always in alignment and prevent it from being presented cornerwise to the yokes at either end of the rack frame.

The outer side of each of the above mentioned yokes is formed by the vertical member of the frame at either end; the inner sides are formed by the pieces *BB*, called shutters. Starting with the parts in the position shown in Fig. 1, we will follow through the movements of a complete cycle:

The gear may be considered to be rotating in a clockwise direction and the rack in full movement to the left. As the crankpin reaches its lowest position the right end of the rack frame has caught up with it and the bearing block *A* settles quietly into the lower right-hand corner, at the same time that the big tooth *C* of the gear comes into mesh with the corresponding big space *D* in the lower rack. The shutter *B* at that end, actuated by a stationary cam, closes behind the bearing block *A*, confining it within a fixed yoke, and the gear rolls clear of the rack.

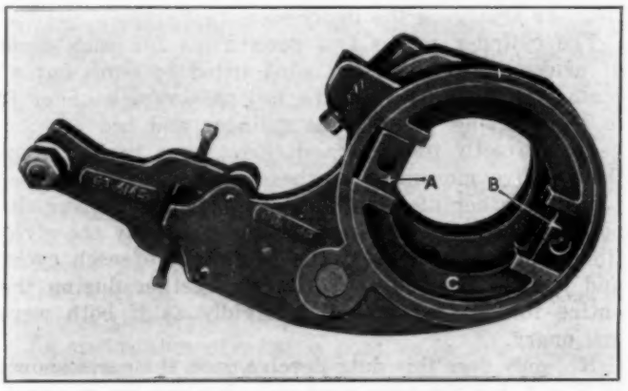


FIG. 5. THE LEVER THAT MOVES THE SLIDING SEGMENT

The gear has now become a crank—without shock to the parts, for all parts are moving in unison. During the next quarter turn of the gear (we will still call it a gear though it is not acting like one) the movement of the bed is quickly slowed until, at just one-half turn of the gear from the position shown in the cut, the bed has come to rest.

From this point the bed accelerates in movement to the right until at the completion of the third quarter turn (from the position shown in the cut) the crank has reached its top position, the big tooth of the gear

(there is but one) is in mesh with the big space *E* of the upper rack. The shutter *B*, released by its cam, now flies open and sets the block *A* free, leaving the rack frame again under control of the gear, which has resumed its normal function.

Now in mesh with the upper rack, the gear sends the frame to the right until, upon reaching the other end of its movement, the block *A* settles into the upper left-hand corner of the frame, the shutter closes and the cycle of movement is repeated, the big tooth of the gear passing out of the upper rack through the space *F* and, upon completion of the half revolution, re-entering the lower rack by the space *G*.

The function of the sliding segment should now be apparent. In the position shown in Fig. 1 the teeth on the upper part of the gear are moving to the right while the rack frame is moving to the left. The teeth of the upper rack have just passed over the blank space of the gear, as well as over the teeth of the withdrawn segment and the first solid tooth of the gear is barely going to clear the first tooth of the middle section of rack, passing at high speed in reverse direction.

When the gear has made exactly one revolution from the position shown in the cut all parts will occupy exactly the same position except that the segment will be in mesh with the upper rack and the frame moving to the right. As the direction of movement of the frame has been reversed, while that of the gear remains the same it is obvious that there should be teeth in the upper part of the gear, but none in the lower part when the swiftly moving rack reaches it.

The shutters *BB* really have little to do, and may be regarded as accident preventers. The press would run as well without them, for the pressure upon the bearing block is always imposed by the outer rigid side of the yoke, first in stopping the momentum of the bed in slowing it to rest, and then in overcoming its inertia during the accelerative period. It would not be safe, however, to run without them, for if by any chance the bed should jump forward out of its true position by the distance of half a tooth or more, the wreckage would be complete.

Learning the Trade Forty Years Ago

By W. S. Davenport

(The second of four articles)

Well do I remember the hot Fourth of July day, so many years ago, when with the aid of the crude lathe I had constructed and the flat drill of "sleigh shoe steel" made for me by the village blacksmith, I succeeded in boring out the cylinder of my first steam engine.

Fourth of July was one of the few holidays that were observed upon the farm and, after the necessary "chores" were done, the whole family except myself piled into the "carryall" to attend the picnic and holiday exercises, leaving me in my little shop with its home-made lathe and grindstone foot power to devote the day to a matter far more important to me than any mere celebration of a national holiday.

Trouble with My Lathe

I could not drive my lathe by means of the pedal and belt to drill such an extremely large hole (it was 1⅛ in.) because it would go too fast and, besides, the belt would slip, so I rigged up a crank on the live spindle and attached a long wooden lever to the tailstock to feed the drill. After a whole day's exertion, during which I lost a great deal of perspiration in my frantic endeavors to be in two places at once, turning the crank with one hand and pulling the lever with the other, I succeeded in getting a hole through the whole 2-in. length of that stubborn casting.

Much to my disgust it was not a very good hole. It was not any too round and, instead of the nice smooth surface suitable for the inner wall of an engine cylinder, it seemed to have a number of rough spiral ridges extending through it. For weeks I tried to study out a way to smooth it up, but in the end I was obliged to take it to the machine shop, seven miles away, where with the aid of a rose reamer in a real lathe it was made true and smooth in a short time.

I managed to face the ends of the cylinder in my own lathe; putting it on a wooden arbor and using a "beechnut" hand-tool that I made out of an old three-cornered file. The heads I machined by holding them in a recessed wooden chuck to which they were fastened by machine screws passing through the chuck from the back. As I look back upon those days I can see that every move was the merest makeshift and that my workmanship was probably very indifferent, but then every piece finished was a triumph that constituted in itself a rich reward.

It was probably a year before that engine was completed, for the only opportunity I had to work upon it was on rainy days and a few minutes stolen each day from the dinner hour; but completed it finally was and I was a proud boy indeed when, after tramping with it to the adjoining town and inducing the engineer of the steam sawmill to connect it to his boiler, I had the satisfaction of seeing it run so rapidly and smoothly.

All good machinists, as I well knew, had tool chests in which to keep their tools, so that winter I set about making one for myself out of a board of butternut wood that I took from a board fence, replacing it, of course, with a less valuable piece of lumber. In making the dovetailed corners of this chest there was a great deal of trying work and many failures, impressing upon me the necessity for accurate workmanship. From that time forward I made it a point to see not how quickly but how well I could do each job.

Having a nice new tool chest it seemed proper to have some tools to put in it, so with much painstaking effort I made several pairs of calipers and a try-square; my materials being broken saw blades and worn-out knives from the mowing machine. Very crude and rudimentary were these early tools, but with each one finished there came the joy and pride of achievement and ownership that has never attended the purchase of much finer tools in a later day.

During the previous summer I had written a letter to the Brown & Sharpe Manufacturing Co. of Providence, inquiring about an opportunity to "learn the trade" with them, and in reply had received a letter (written with a pen and now much prized) from the hand of Mr. Lucian Sharpe himself, in which letter there was enclosed a copy of their terms of apprenticeship. I could not, however, raise the one hundred dollars that was a condition to the indenture, nor did I possess even the means to pay my fare to Providence, to say nothing of living expenses in that city, for at that time they paid but 40 cents a day to boys in the first year.

TABLE II

United States—Imports of Machine Tools*

Country	1915	1916	1917	Fiscal Year Ending June 30th, 1918	July 1st to Dec. 31st 1918 ** Number	July 1st to Dec 31st 1918 ** Value	Number	1919 Value	Number	1920 Value	Number	1921 Value
Austria-Hungary***	$ 1,829	$.....	$.....	$.....	.....	$.....	.....	$.....	522	$ 80	36	$ 8,086
Belgium	31,633	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
France	2,902	1,526	494	.....	.....	.....	294	1,428	212	6,241	93	6,205
Germany	84,211	.....	.....	.....	.....	.....	25	91	7,864	74,681	1,234	91,650
Greece	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Italy	.....	252	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Netherlands	422	.....	.....	.....	.....	.....	.....	.....	5	24,238	2	4,290
Norway	.....	.....	12,060	.....	.....	.....	.....	.....	1	191	.....	.....
Sweden	.....	.....	13,159	.....	34	26,149	.....	.....	.....	.....	9	366
Switzerland	2,380	4,457	.....	20	.....	.....	32	73,352	379	222,621	1,041	48,785
England	21,250	30,816	12,541	15,058	15	5,952	1,861	51,013	352	88,963	2,219	26,083
Scotland	1,790	68	1,456	.....	.....	.....	25	1,152	8	435	1	17
Denmark	.....	.....	.....	.....	10	86,832	.....	.....	1	150	.....	.....
Spain	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	1,834
Canada	13,470	73,235	82,547	259,104	89	79,391	1,199	12,192	152	25,050	174	27,309
Honduras	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Panama	.....	.....	.....	95	.....	.....	.....	.....	.....	.....	.....	.....
Mexico	45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cuba	89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Argentina	.....	1,620	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
British West Indies	.....	.....	.....	.....	.....	.....	.....	.....	6	3,098	.....	.....
China	.....	.....	.....	9,274	.....	.....	.....	.....	.....	.....	3	2,991
British India	.....	.....	.....	180	.....	.....	.....	.....	.....	.....	.....	.....
Japan	100	423	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Australia	262	.....	.....	.....	.....	.....	1	200	.....	.....	.....	.....
Union of South Africa	61	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	$160,486	$112,397	$122,257	$283,746	148	$198,324	3,438	$139,619	9,501	$446,557	4,816	$217,616

*Included in "All Other Machinery" prior to 1915.
**Number not shown prior to 1918.
***Austria—only after 1918.

Industrial Cost Accounting for Executives—II

Setting Selling Prices—Controlling Methods of Manufacture and Expense Determining Profitable Lines

By PAUL M. ATKINS

IT WAS pointed out in the first article that it was quite appropriate to give the reader some idea of the benefits to be gained from a well-planned, properly installed cost system before taking him into a discussion of its details. The uses, especially from the executive point of view, have rarely been fully recognized and, when they are, the value of a good cost system to a company will be much more appreciated.

Probably the most commonly accepted idea of the use to be made of cost accounts is as a basis for selling prices. There are unquestionably many cases where this is true, and more frequently, perhaps, in the machine-building industry than in most others. It will occur from time to time that machines are built on a cost plus basis and hence the cost must be ascertained before the selling price can be determined. The cost plus system which received such an impetus during the war proved not to be successful, except within a rather limited range of circumstances, and has now been pretty generally dropped.

There are numerous other circumstances in which the cost records are employed for the establishment of selling prices where the connection is not quite so direct. Wherever bids are made and estimates prepared for the setting of selling prices, the cost records should be employed.

Using Cost Records of Other Jobs

It is true that the cost of the actual product, which is being made to fill the order taken, does not enter into the calculations, for the cost cannot be found until after the work has been done. The costs of other jobs of a similar sort, however, are the ones which are used in preparing the estimates or are employed to check the estimates once made.

This use of the cost records will be clearer if we study the matter a little. Material, for example, is usually specified by the engineering department and the quantity per unit or for the entire order indicated. If the material is purchased outside, bids will be obtained or the market price used in estimating the cost. If the material is produced inside the plant, then it is necessary to turn to the cost records to get information about its probable cost.

Whether the material is purchased outside or produced inside the factory, its consumption must be checked by means of the cost records. It is not enough to provide sufficient material for the order if all goes well, but it is necessary to make sure that all probable scrap and wastage is provided for also. This additional material is properly a cost of the order and when an estimate is prepared as a basis for a selling price, its value must be included.

Not only must material be considered but also labor and burden. Without cost records of previous orders, the estimate of these items is likely to be nothing more than a wild guess and wild guesses at any time, and particularly at a period like the present when business is being carried on on close margins, are likely to prove disastrous. An analysis of the business failures in recent months will prove this conclusively. In any business, therefore, where the selling prices are based on estimates and are controlled wholly or in a considerable measure by the executives of the company producing the goods, costs of production are one of the chief sources of information on which the executives may base their judgments.

Industries Where Costs Do Not Affect Selling

While all this is true in regard to many cases, there are more where the costs of production have relatively little or no effect on the selling price obtained by the concern. There is, of course, no hard and fast line separating one class of cases from another. They merge one into another, and often the use of cost records for this purpose will vary in importance among companies and with the condition of the business world. For a very large number of goods which are staples like working shoes, cotton sheeting and certain basic steel products, the selling price is largely determined, if not wholly set, by world-wide market conditions, and not by the act or influence of any one manufacturer.

Cotton sheeting offers a pretty good example of this kind of thing. It is made in this country, in England, France, Germany, India, to mention only a few of the principal producing countries. The price, like that of wheat, is based on the English market. No single manufacturer can raise the price of his product more than a very small amount above the current market price without giving some corresponding advantage, such as better quality, without sooner or later losing his business. For the individual producer, it is a case of getting his cost of production to the point where he can either make a profit or quit the business.

All this does not mean that a good cost system is not of value to the executive in this kind of business. If anything, an accurate knowledge of costs is of even more importance. Unless he knows what his goods are costing him and how those costs are accumulated, he is in no position to study the causes of the several items of cost and in this way learn in what direction he should bend his efforts to reduce them. The closer the margin between the cost price and the selling price, the more necessary for control purposes are detailed costs of production.

The Monopoly Type of Business

There is still another type of business which has not yet been mentioned and which lies at the opposite end of the scale from the one just discussed, the business which is a monopoly or a semi-monopoly. Here the cost of production plays only an indirect part in the setting of selling prices. In such an industry the selling price is usually set at a figure which will give the largest volume of sales measured in terms of money. This often means, of course, that the selling price per unit will be relatively low in order to increase the volume and thus to increase the returns. Some idea of the

cost of production must be had before the selling price can be set but an approximation is usually all that is needed. As in the case before, this does not mean that cost records are valueless. They still have an important part to play in guiding the executive in his efforts to keep costs down.

The reader will probably have noted that the emphasis has been laid so far in connection with use of cost figures for setting prices on the control which the executive may exercise through the knowledge gained from them. That is really the heart of the value of cost statistics to the executive. They are or should be an instrument of control in his hands to aid him in directing his business in such a way as to bring the greatest possible returns to those who take part in it. It should not be inferred that "control" is used as a synonym for oppression of the workers.

The wise manager knows that such practices will simply kick back at him in the long run and that the more generous he can be to his employees within reason, the better off his business will be in the long run. It is poor kindness as well as poor judgment to pay wages so high that the business will be ruined and all employees thrown permanently out of employment when a slight or temporary reduction in the wage scale will permit the business to continue. Control implies the exercise of wise judgment to meet the needs of the particular situation.

Importance of Controlling Inventory

One of the hardest elements in almost any manufacturing concern to control is the inventory. From the viewpoint of the control in production, we have our material records or balance cards as they are often called. The same cards have a part to play in the cost records of material as will be explained in a later article. But it is not sufficient to have records of quantities of material only, it is also necessary to have a record of their value. To ascertain the real value of the materials actually on hand in the storeroom has always been a bugbear of every manager. Usually this has been accomplished in the past by taking a physical inventory from time to time but, as every one who has had experience with physical inventories knows, the best results are far from satisfactory and the poorest are worse than useless. An adequate cost system will provide a means for recording the receipt and issue of material so that the balance remaining in the storeroom may be found at any time.

It should not be forgotten that if the problem is complex and difficult for material purchased outside the company it is doubly so for material made inside the factory unless there is a good cost system. The only way to find the cost price of material so made and stored until it is needed for the final product is by means of the cost records.

The assistance which a good cost system can render a business in connection with its inventories does not stop here, however. It must be remembered that the materials in the storeroom awaiting use or in the stockroom awaiting shipment are only a part of the entire inventory. There are all the goods in process out in the factory to be thought of also. To take a physical inventory of all such goods is even more of a task and less satisfactory than the same kind of inventory for materials in the storeroom. A good cost system will provide the figures wanted at the end of each month or whenever they are needed on very short notice. The method will be fully explained in the later articles.

With the inventories before him during the first week or ten days of each month, the executive is in a position to make decisions with definite knowledge. What is more, he can have a balance sheet ready to present to his bankers and so be in a position to establish the standing of his concern with them in a way which is quite impossible without such aid. It is of vital importance for the factory executive to appreciate the importance of dollars and cents records of material. Accustomed as he is to thinking primarily in terms of quantities, he sometimes forgets that quantities represent money which the company must provide in some manner if it wishes to continue in business.

There are certain incidental advantages to be gained from this knowledge of the inventories. Accumulations of obsolete and useless material may be detected before it is too late to deal properly with them. The detection of losses and thefts of material is also greatly facilitated if adequate cost records are kept. When the material inventories are large, the item of insurance premiums is often a considerable one and the amount of "effective" insurance can be regulated only if inventories are accurately and promptly maintained. Practical experience with particular instances will show other ways in which inventory information is of value in the business.

A good cost system provides a means for measuring the worth to the company of its equipment. The question may arise as to whether or not it is desirable to change one machine for another, to modify a process in some way or to install additional equipment. It not infrequently happens that the answer to such a question is in the affirmative from the engineering point of view. Production quite possibly may be increased and even improved in quality. If, however, normal production is not sufficient to keep that equipment busy all or most of the time, the burden charge for its use may so increase the cost of turning out the product as to render it undesirable to make the change. A satisfactory cost system will give the cost of the present operation and will provide a basis for calculation of the cost of the proposed method and make possible a comparison on a commensurable basis.

Cost Records Point Out Unprofitable Lines

Another aid which the cost records may furnish is information about unprofitable lines. It not infrequently happens that a few principal lines of goods provide all the profits for the company and serve to make up the losses on other lines. With the knowledge of the relative value to the business of the different lines, the manager is in a position to decide what to do. Often this means simply cutting out certain lines altogether. Sometimes it results in combining the best qualities of several lines or sizes and replacing several by a new line. On other occasons it may prove necessary to carry a full line in order to meet competition, and hence be impossible to cut out any. In such a case, the information is just as valuable, for it enables the manager to guide his sales in such a way as to reduce the unprofitable business to a minimum or to insist that all unprofitable orders shall be accompanied by a certain amount of the profit making variety. Such control is absolutely impossible if it is not possible to obtain detailed and accurate costs of production on short notice.

Perhaps the most important way in which a cost

system can serve the executive has been left to the last. The problem of expenses is always one which bothers the manager unless he has adequate means for recording expenditures. If he develops a system he is then-in a position to control them. In a continuous process industry, turning out a single line of product the costs of production are not likely to fluctuate violently. Test runs, if properly administered, will frequently give all the needed information in regard to the cost of the product. But even so, the manager cannot afford to be without continuous and definite knowledge of what the various departments are costing him to operate; in other words, his expenses.

One of the best instruments for the control of an entire business is a budget or schedule of prospective expenses. The budget enables them to plan for the future in a way which is quite impossible without it. The budget schedule is only one-half of this means of control, the other half being the record of what the expenses actually are as they take place. They are like two halves of a pair of scissors, neither side will cut well without the other. With such records in hand, the executive is in a position to measure the efficiency of his various departments, to take steps to check unwarranted increases in expenses, and to anticipate difficulties before they come in such a way as either to prevent them or to be ready for them.

Conclusion

The brief space available has permitted the outlining of only a few of the possible uses of cost accounts and records. Perhaps enough has been said, however, to give some idea of their variety and as the reader thinks over the conditions in his own factory he will undoubtedly recall many other possibilities.

The next task which lies before us is to consider what are the elements which go to make up manufacturing costs and this will be done in the following article.

Standards for Portable Electric Drills

What are believed to be the first standards for portable electric drills have been adopted by the Electric Power Club. These rules are the nucleus of a complete group of electric tool standards, and include the test requirements of motors, the performance specifications for drilling, standard sizes of drills and the information that should be given on electric drill name plates.

As electric drills are now widely employed as tools of production, as well as for maintenance work, the users of these tools have felt for some time that they should be standardized. To meet this need, the electric tool section of the Electric Power Club, which comprises the representative portable electric drill manufacturers of the country, has undertaken the standardization work.

The following is the report of the Electric Tool Section as it was adopted by the club:

(1) Definition: A portable electric drill is defined as a compact, semi-enclosed electric motor in combination with mechanical features so designed and constructed as to be applicable for drilling or reaming in wood or metal, more or less intermittently. Adopted Standard.

(2) Voltage ratings:

(a) Standard voltages for d.c. electric tool motors shall be 115, 230 and 550 volts. Adopted Standard.

(b) Standard voltages for universal electric tool motors shall be 115 and 230 volts. Recommended Practice.

(c) Standard voltages for polyphase a.c. tool motors shall be 110, 220 and 440 volts. Adopted Standard.

(3) Frequencies:

(a) Standard frequencies for polyphase a.c. tool motors shall be 60 cycles. Adopted Standard.

(b) Electric tools equipped with a universal motor shall not be guaranteed for operation on frequencies in excess of 60 cycles. Adopted Standard.

(4) Allowable variation from rated voltage: All motors shall operate successfully at normal rated load at any voltage of not more than 5 per cent above or below the name plate rating, but not necessarily in accordance with the standards of performance established for operation at normal rating. Adopted Standard.

(5) Performance specifications: The minimum drilling requirements of portable electric drills shall be based on the drilling of holes in 20-30 carbon steel with carbon steel twist drills of the full rated capacity of the electric drill, at a cutting speed of approximately 50 ft. per minute and at the following minimum rate of feed per minute for the various sizes of drills:

Twist Drill Diameter Inches	Drilling Depth Per Minute Inches	Twist Drill Diameter Inches	Drilling Depth Per Minute Inches
3/16	1 5/8	7/8	7/8
1/4	1 1/2	59/64	7/8
5/16	1 3/8	1	13/16
3/8	1 1/16	1 1/8	11/16
1/2	1 1/8	1 1/4	5/8
9/16	1 1/16	1 3/4	9/16
5/8	1 1/16	2	1/2
3/4	13/16		

Recommended Practice.

(6) Temperature rise:

Temperature rise in degrees centigrade when operating under normal conditions as specified on the name plate.

Class of insulation	*A*
Load, per cent of rated capacity	100
Time rating	Intermittent
1. Core and windings	
Fully enclosed motors.	55 deg.
All other types.	50 deg.
2. Commutators	
a. If Class A insulation is employed in the commutator, or is adjacent thereto and its life would be affected by the heat from the commutator.	65 deg
b. In all other cases.	85 deg.
3. Bare copper windings	60 deg.
3A. Bare copper windings, enclosed motors. Provided the thermometer is applied directly to the surface of the bare copper winding.	65 deg.
4. Mechanical parts	
†Temperature rise of all mechanical parts not in contact with insulation may be such as will not be injurious in any respect.	†

Adopted Standard.
Maximum Limits.

For descriptive specification covering classes of insulation, see Reference Number 5001.

All temperature measurements by thermometer method. See Reference No. 5301.

All temperature rises are based on an ambient temperature of 40° C. See Reference Number 5002. General guarantees do not apply, and deterioration of insulation may be expected, if this ambient temperature is exceeded in regular operation.

For descriptive specifications covering temperature ratings see Reference Number 5303.

(7) Name-plate marking: The following minimum amount of information shall be given on all name plates:
(a) Manufacture, design of type and frame size.
(b) Horsepower output.
(c) R.p.m. at rated load.
(d) Frequency if a.c.
(e) Number of phases if a.c.
(f) Voltage.
(g) Rated load amperes.
(h) Time rating.
(i) Serial number.
(j) Drilling capacity or reaming capacity for a drill.
(k) Blank space for customer's shop number.

Recommended Practice.

(8) Standard sizes: The standard ratings for portable electric drills shall be as follows:

Universal Drills—Single Speed

Chuck Division Inches	Morse Taper Socket Division Inches
1/16	1/16
1/4	7/8
5/16	1 1/2
3/8	
1/2	

Universal Drills—Two Speed

Chuck Division Inches	Morse Taper Socket Division Inches
1/2	1/16
	7/8

Direct Current Drills—Single Speed

Chuck Division Inches	Morse Taper Socket Division Inches
3/8	1/16
1/2	7/8
	1 1/2
	1 3/4

Direct Current Drills—Two Speed

Chuck Division Inches	Morse Taper Socket Division Inches
1/2	1/16
	7/8

Polyphase—60 Cycle—Single Speed Drills

Chuck Division Inches	Morse Taper Socket Division Inches
3/8	1/16
1/2	7/8
	1 1/2
	1 3/4

Polyphase—60 Cycle—Two Speed Drills

Chuck Division Inches.	Morse Taper Socket Division Inches.
1/2	1/16
	7/8

Direct Current Reamers

Morse Taper Socket Division, Inches

11/16 (with No. 2 socket) 13/16 (with No. 4 socket)
13/16 (with No. 3 socket) 1 1/16 (with No. 4 socket)

Polyphase Reamers—60 Cycles

With Morse Taper Sockets, Inches

11/16 (with No. 2 socket) 13/16 (with No. 4 socket)
13/16 (with No. 3 socket) 1 1/16 (with No. 4 socket)

Adopted Standard.

(9) Hydro-Electric Power Commission, Toronto, Ontario. In December, 1921, eight member companies submitted samples to the above for test and approval. About a month and a half or two months ago, the Secretary of the Power Club inquired concerning the outcome of this test and what treatment was accorded the various companies who had submitted machines. All tests have not been concluded, consequently no definite information is available at any time for the benefit of other sections interested in the outcome of this test.

Consumption of Metal Products in Russia Before the War

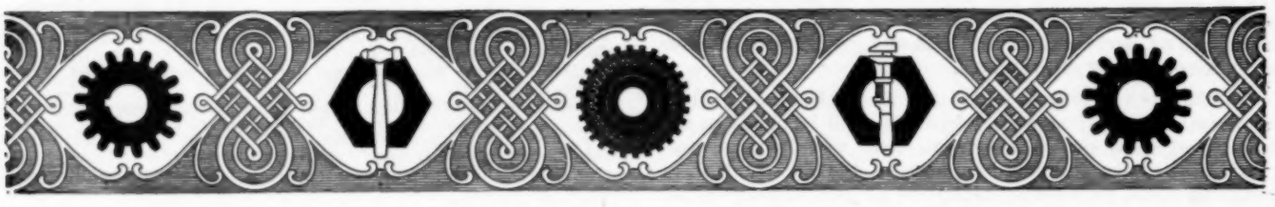
By R. Poliakoff

The following table, which may be of interest to American readers, has been compiled from official Russian sources and gives an idea of the potential volume of the Russian market in metal products. The figures are for the year 1912. All data of the first three columns are in millions of dollars.

POTENTIAL RUSSIAN MARKET FOR METAL PRODUCTS

Name of Article	Produced in Russia	Imported	Capacity of Market	Loss Per Cent
	—Millions of Dollars—			
1. Agricultural machinery	26	31.5	57.5	12
2. Railroad cars	20.5	0.5	21	26
3. Locomotives	10	0.5	10.5	..
4. Merchant vessels	8.6	1.6	10.2	5
5. Electric machines and apparatus	8.4	4.5	12.9	51
6. Sewing machines	7.5	4.0	11.5	..
7. Gas and oil engines	5.6	6.0	11.6	27
8. Steam boilers	4.8	1.3	6.1	65
9. Pumps	2.6	3.6	6.2	19
10. Textile machinery	2.25	0.75	3.0	31
11. Metal working machines	1.4			60
(Machine Tools)		6.5	8.5	
Woodworking machines	0.6			79
12. Bicycles	0.85	1.45	2.3	66
12. Automobiles and motorcycles	0.6	7.3	7.9	58
14. Aeroplanes	0.15	0.15	0.30	40
15. Steam engines	0.65	2.25	2.90	49
16. Printing machines	....	0.85	0.85	..
17. Typewriters	....	0.60	0.60	..

The figures of the fourth column show the loss in per cent of the yearly Russian output due to the decrease of territory on account of the separation of Poland, Lituania, Finland and the Baltic Provinces. With regard to the figures of this column, one has, however, to take also into account that the actual loss of output, as shown by them, would, under normal economic conditions, be less, as a considerable part of the equipment of the enterprises in the lost provinces was evacuated during the war into the interior of Russia and could be used for Russian domestic production, normal conditions.



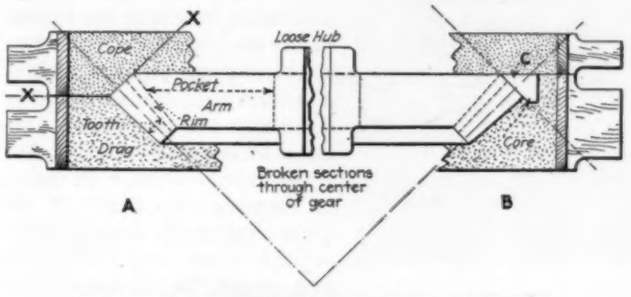
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

A Better Way to Mold Gear Wheel Patterns

BY M. E. DUGGAN

In the broken section shown at *A* in the accompanying illustration appears the conventional method for molding a gear wheel in green sand, with the parting along the lines *XX*. This method is often the cause of a great deal of lost time in the fitting shop by reason of the necessity for correcting defects in the casting that result from "shifting" or mismatching of the cope flask. The space between the arms is molded in green sand and this sand is lifted with the cope. The cope hub is loosely fitted to the pattern. A foundry that is fully



TWO WAYS OF MOLDING A GEAR PATTERN

equipped with the necessary rigging to handle this class of work can do it very nicely, although few general jobbing foundries are so equipped.

A few of the details that make trouble for the molder in the average foundry are: The shifting of the cope flask; the rising, or rocking, of a poorly fitting cope; or a "crush" in the setting thereof. Again, it sometimes happens that the pattern maker is not quite sure how the gear is going to be molded and in order to play safe he will make the sides of the arms parallel, thus making the lifting of the green sand between them a very difficult task for the molder. When a "rise" or "crush" or "shift" has occurred, the resulting casting will have a fin along the cope edge of the teeth that makes a lot of extra work in the cleaning room.

When the molder finds that the sides of the arms are too straight to insure an easy and clean lift he will convert that part of the pattern into a corebox and make a dry sand core in each of the pockets between the arms, marking each core and space into which it fits so that he may be sure to return each core to its respective place and avoid the trouble that would otherwise surely follow by reason of the pockets not being all of exactly the same size and shape. At *B* in the illustration is shown the pattern made and molded in another and better way, as none of the above-mentioned troubles will affect the production of a clean true casting with but a minimum of chipping required along the edges of the teeth. The pattern is made with a ring coreprint, as at *C*, and the parting is in a straight line along the edges of the arms. The whole pattern is molded in the drag with a "flat-back" cope except for the loose hub.

This method of molding the arms should be made with plenty of draft, thus simplifying the making of the cores within the pockets. These cores are suspended from the cope and lifted with it. The corebox for the ring core is made $\frac{1}{8}$ of the circumference of the pattern. The pattern is laid on the molding floor with the parting face down and molded in the usual way. It is then "rolled over," the cope flask put in position, the core suspension wires securely fastened to cross-bars on top of the cope flask, the molding of the cope finished and the cope lifted off. The pattern is then drawn, the ring cores set and the cope returned to place ready for pouring.

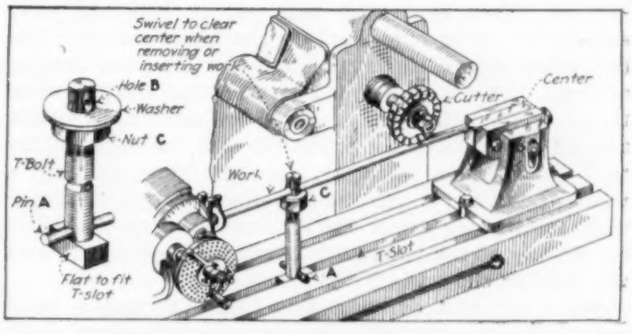
Work Support for the Milling Machine

BY HARRY MOORE

Some time ago we had an ordinary job of milling, that of milling two opposite flats on the ends of some $\frac{1}{4}$-in. rods, that gave us a lot of trouble because of the necessity for continually adjusting the supporting jack to stop the chatter. Our results were very unsatisfactory.

The operator finally made the device here shown, which consists of an ordinary T-head bolt with the head ground away to fit the narrow part of the slot in the table and a cross pin to rest upon the table surface. A hole was drilled at right angles through the upper end of the bolt to fit the rods and a nut and washer placed upon the threads to screw up against the rods from the under side.

As the hole at the top is carefully located at the correct distance from the supporting pin there is no need for further adjustment and the nut can be screwed



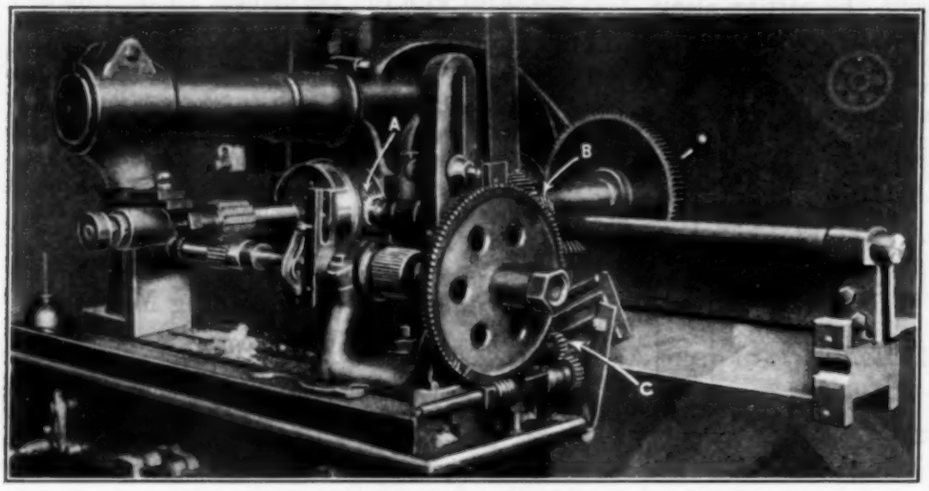
SPECIAL SUPPORT FOR SLENDER WORK

up to hold the rod tightly. At the same time as the head of the bolt fits the narrow part of the T-slot only, the whole thing may be tilted to replace the work. It required but a few minutes' time to make the device and the results secured justified this expenditure by the saving effected on even a very few of the rods.

An Improvised Gear Hobbing Machine That Paid For Itself

BY ROBERT BRAINARD

The machine described in this article has paid for itself many times over and is still in use in the shops of the Joslyn Mfg. Co., Chicago, Ill. Having a few gears to cut occasionally and an old milling machine that had seen its best days, the foreman decided to kill two birds with one stone. He cut off the lower part of the arm bracket, which carries the bearing for the outer end of the arbor, and attached a flat plate to it by means of a couple of screws. To a similar plate was attached a screw center. The two plates were then bolted together with two cap screws. Next a shank



AN IMPROVISED GEAR HOBBING MACHINE

was turned to fit the taper in the machine spindle and the large end of the shank was formed to act as a socket for a ball and socket joint.

After this had been put into the spindle, an internal ring gear was cut and attached to a round plate with a hub that was threaded to fit the thread on the spindle nose. The plate had a bevel gear cut on the back of it to mesh with the bevel pinion *A*. A cutter arbor was attached to a gear that fitted into the internal gear, as shown, the end of the arbor projecting through the gear with a ball turned on the end to fit into the socket in the spindle. Then the cutter was put on and the outer end of the arbor supported by the screw center. The two gears were of the same pitch and the same number of teeth, but a little extra clearance was allowed when the gears were cut, which allowed the arbor to be swung around at an angle to correspond with the angle of the teeth of the hob while at the same time forming a positive drive. A curved slot was cut in the upper plate for the cap screw and graduations were scratched on the top of the plate to indicate degrees. The work was held as shown.

Bevel pinion *A* drives a long shaft carrying a bevel gear *B* that meshes with another gear on a short shaft and thus drives a train of gearing that controls the work-arbor. Gear *C* is an intermediate gear that can be moved on the block on which it is located so as to accomodate the various change gears that have to be used to secure the correct ratio between the hob and the work. As there is no backlash between the worm and wormwheel, it is a comparatively simple matter to turn out first-class work with this outfit.

Cams for Brown & Sharpe Automatic Screw Machines—Discussion

BY S. N. BACON

Under the above title on page 460, Vol. 57 of the *American Machinist*, Stephen McEvoy makes a very good comparison of single and double layout methods. There is another method of double layouts which has caused much misunderstanding, namely; the forming, drilling and cutting off of two parts, instead of one. Many engineers and superintendents, having only a general knowledge of screw machine practice, are of the opinion that this method will result in increased production, but designers of cams, who have analyzed the required feeds and speeds generally agree that the double system is not more productive than the single and is less efficient. It is true that a double cut off tool may be used and the second piece partly cut off while the first is being separated from the bar and that in the drilling, reaming, etc., of both parts, time is saved in indexing the turret. In the majority of cases, when machining one piece at a time, the turret operations (including indexing) are performed during a forming operation. Another point to bear in mind in forming two parts at the same time is the double width of the form tool. Such a tool should be advanced but one-half the amount per revolution of the spindle than would be the case were the single tool used, therefore there would be no saving in time and a more expensive tool would be required.

Double jobs also give trouble in keeping the parts to length, as the length of the first part cut off the bar is gaged between the cutoff tool and the stop in the turret, while the length of the second piece is gaged between the two cutoff tools. As there are exceptions to every rule so will there be a few cases where the double cross-slide tooling or the double cams and turret tools can be used advantageously.

Lubricants for the Shop—Discussion

BY LESLIE TOURTELLOTTE

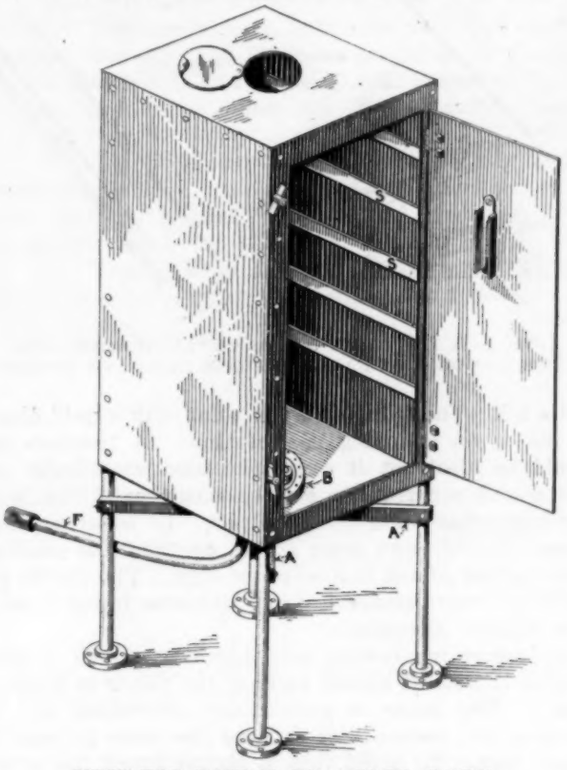
Referring to an article under the above title by H. R. Smith on page 462, Vol. 57 of the *American Machinist*, may say that I have used lard oil and turpentine for a long time, but one time I was cutting a thread and it would tear in spite of anything I could do until the old mechanic said to me "Why don't you put some white lead in your oil?" So I used lard oil, turpentine and white lead. It worked fine; so now we use it nearly all the time. The white lead will settle to the bottom of the can but with a little stirring once in a while it will be all right. It is applied with a brush and should be just thick enough so it will stick on the work without running off too readily.

For a lathe center lubricant we use machine oil and white lead with very good results. It is mixed just about as thick as paste and a little will go a long way.

A Simple Enameling Bake Oven

By Donald A. Hampson

The drawing shows a small oven that may be constructed in any shop at a cost of a few dollars, mostly spent for labor. It will answer its purpose as well as a much more expensive outfit and, moreover, it is portable and may be taken from department to department, if the work so requires. It may also be carried outside of the shop for storage purposes when not being used. As an instance of the desirability of a portable outfit, one shop's experience shows that such an oven was used for two hours on July 10 for baking twenty-five auto horn cases, four hours on July 30 in one of the



OVEN FOR BAKING ENAMELED WORK

private experimental rooms on some radio models, then not again until Sept. 5 when it was used on the floor of the main machine shop for baking the finish on a copying press that had been repaired for a nearby office.

The oven is constructed of half-inch pipe and 24-gage galvanized sheets together with a few pieces of hardware. The four "sides" are alike and are screwed to the pipe standards. The top has two edges turned down and stove-bolted to the sides proper; the opening of the vent may be adjusted by means of a swing cover. The hinged door on the front laps a half inch over the opening cut in the front sheet and is held in a closed position by two metal buttons.

Two cross pieces, *A* and *A*, are screwed to the legs some distance below the sheets to form a support for the burner *B* which is merely the burner from a discarded gas stove. An eight-inch burner serves very nicely for an oven 24 x 24 x 42 in. If the ovens were set up permanently, it would be connected with the gas supply by iron pipe, but in a majority of cases the familiar soft connection *F* is all that is needed and is perfectly satisfactory. To avoid soot and smoke from city gas, it will undoubtedly be necessary to introduce more air into the burner to get a clean bunsen flame and, once adjusted, it will not have to be touched again and the only attention in lighting up will be to regulate the cock for the size of flame desired.

A thermometer will be observed hanging on the inside of the oven door. This location is not ideal but it is convenient and as good as any, for no one location in such an oven reads true for all others. For baking the class of work intended, an exact temperature is not necessary, so that a thermometer reading of say 275 deg. may be assumed as giving a fair baking temperature for a given class of work in all parts. Readings can be taken and the flame adjusted accordingly, by opening the door for a moment. Various ways of supporting the work pieces will suggest themselves in each shop. In this oven, strips *S*, *S* are stove-bolted to the side sheets and upon the strips the rods for hanging the work are laid.

Knurling Bushings in an Automatic Screw Machine

By S. N. Bacon

An interesting problem in automatic screw machine work is shown in Fig. 1. The collar is made from ¼-in. brass rod and is counterbored in one end and countersunk and knurled in the other. It would be a simple matter to countersink and knurl from the turret, then counterbore the opposite end in a hand screw machine but as this would add considerably to the production cost of the piece the machine was tooled up, as shown in Fig. 2, and completed in one setting in a No. 2 Brown & Sharpe automatic screw machine.

After the work has been drilled, reamed and counterbored it is countersunk at *A* by use of the turret swing

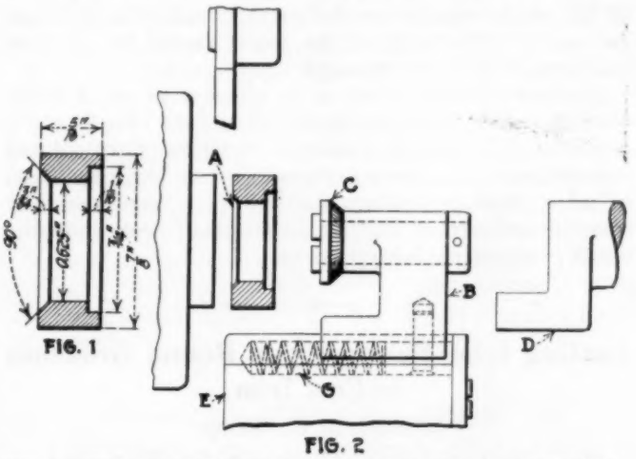


FIG. 1 FIG. 2

FIG. 1—THE BUSHING TO BE KNURLED. FIG. 2—ARRANGEMENT OF KNURLING TOOL AND HOLDER

or recessing tool. The knurl holder *B* carrying knurl *C* is operated longitudinally by the pusher *D* mounted in the turret. The knurl holder *B* is slidably mounted on the special tool post *E* and is returned, when the turret has withdrawn, by the compression spring. The base of knurl holder *B* is fitted to toolpost *E* with a dovetail slide of sufficient width to prevent chatter.

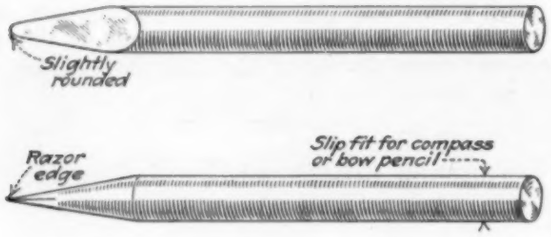
In operation, the front cross-slide can advance the knurling tool transversely and causes it to dwell, while the lead cam advances it longitudinally, into the hole and, in turn, causes it to dwell while the cross-slide cam advances it for a second time, feeding it into the work.

Making Paper Models in the Drafting Room

By Hugo F. Pusep

Frequently the tool designer needs a paper model of the piece for which he is to design blanking and drawing dies or other tools. Such a model is of great help in calculating the correct proportions for the design.

The model is laid out on thick drawing paper to the dimension taken from the part print and, when cut out along the pencil lines, becomes an accurate duplicate of the part to be made. Straight lines are easily cut by laying a scale or straightedge on the paper and following it with a sharp penknife, but the radii present



POINTS FOR CUTTING PAPER MODELS

greater difficulties. Some draftsmen use scissors for cutting around the curves, but this is an inaccurate and unsatisfactory procedure.

To make a tool suitable for this purpose, take a piece of drill rod of the same diameter as the compass lead and file or grind it to a round chisel point, as shown in the sketch. Harden this point to glass hardness and then hone it to a real razor edge.

The piece or drill rod may now be secured in the bow-pencil or compasses and, with the needle point on the center of the radius, it needs only a few passes of the sharp point over the curve to cut clear through the paper. The radii of the model should be cut first and joined with the straight lines.

Another valuable kink is to place a piece of thick blotting paper under the model to be cut. The blotting paper has the peculiar quality of resisting sharp pointed instruments, yet allowing them to retain their keenness of edge, thus protecting the drawing board and any other drawing that may be under the model while the cutting operation is carried on.

Getting Long Service from Round Broaches in Cast Iron

By George E. Hodges

The writer always gains a few hundred pieces from round broaches on cast iron work by having the new broach oversize and using a lubricant. This would seem odd to those who have set opinions about lubricating tools cutting cast iron but the writer has found that it pays. The cast iron hole closes in about 0.0015 in. on a one inch hole when lubricant is used.

After the broach is used until it cuts small, the lubricant is discontinued, and the broach is good for as many pieces as though it was made to size in the first place. The only disadvantage of this plan is the difference of finish, the one obtained with lubricant being far superior. Soluble oil, diluted as for broaching steel is the lubricant used.

Drafting Room Kinks

By G. A. Luers

A double pen, consisting of two pen points placed in one holder with the points overlapping, as shown in Fig. 1, is a time and effort saving device for work with

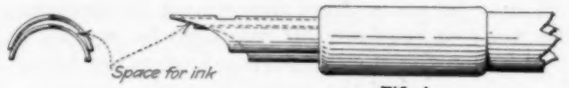


FIG. 1

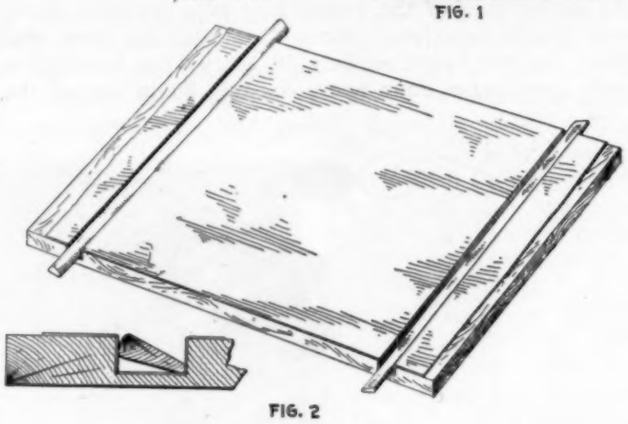


FIG. 2

FIG. 1—A PEN THAT HOLDS CONSIDERABLE INK
FIG. 2—HOLDING PAPER ON THE DRAWING BOARD

India ink. The filling of a pen point with a quill dipped in ink is an annoying loss of time. A fountain pen would be ideal but it cannot be used with India ink. The double pen requires only an occasional filling, serving somewhat as a fountain pen. In lettering work when the body and arms are in position, the constant replenishing of ink is a waste of time. The double pen method is more economical and has been found to be of considerable advantage.

A feature in drawing and sketching, which is undesirable is that of thumb tacking the paper to a sketch board. The paper is continuously shrinking and expanding and necessitates shifting the tacks to have the paper taut. To avoid this, a sketch board made with a groove and a wedging slat at each end, as shown in Fig. 2, has proved of much advantage in placing the paper. With this arrangement no tacks or tack pullers are required and the corners of the paper are not mutilated or corners of the board so perforated that they fail to hold tacks after a period of use.

The paper is made taut by pushing one of the slats into the groove while the other is in place. For thin sketch boards, where the depth of groove is limited, brass strips can be advantageously used in place of wood slats. In either case the fastenings will be below the surface of the board and the T-square will slide freely over them.

Soliloquies of Old Mac

To get a firm grip on a piece of thin tubing without flattening it or leaving the marks of the vise jaws on it, fold a strip of fine abrasive cloth so the abrasive is on the outside. Make a loop of the cloth about the tube and grip the ends in the vise as close to the tube as possible.

It is surprising how tightly the tube may be held in this manner.

Bolt Head and Nut Standards

The National Screw Thread Commission is at work on the problem of standardizing bolts and nuts so as to reduce the number of wrenches now necessary. Recent meetings at Washington, D. C., and Springfield, Vt., brought out much interesting discussion. While it is desirable to have both bolt heads and nuts of the same dimension, the question of securing punched nuts of as small a diameter as is perfectly safe for the head was brought up by bolt makers. This is particularly true when it comes to considering the proposition to adopt the S.A.E. sizes for all work. The following recommendations were submitted:

1. Bolt Heads and Nuts.

(a) Bolt heads, nuts, and capscrews shall conform in short diameter and thickness to the U. S. Standard for coarse threads and to the S.A.E. Standard for fine threads, modified as shown in columns 3 and 4, Table I, N.S.T.C. No. 39.

(b) The maximum width across the flats, short diameter, shall be basic size and this maximum width shall apply to finished, semi-finished, and rough hexagonal and square bolt heads and nuts.

(c) Tolerances on all bolt heads, nuts and capscrews shall be *minus* and in amount as follows:

Bolt Size	Tolerance
1/4 in. to 1/2 in.	0.005 in.
9/16 in. to 1 in.	0.008 in.
1–1/8 in. to 2 in.	0.010 in.
2–1/4 in. to 3 in.	0.012 in.

The allowances and tolerances on openings of wrenches shall be *plus* and in amount as follows:

Bolt Size	Allowance	Tolerance
1/4 in. to 1 in.	0.002 in.	0.005 in.
1–1/8 in. to 2 in.	0.004 in.	0.008 in.
2–1/4 in. to 3 in.	0.006 in.	0.010 in.

2. Machine Screw Heads.

(a) Standard designs of machine screw heads shall be limited to the following:

1. Round head
2. Flat head countersunk (82 deg.)
3. Oval countersunk (82 deg.)
4. Flat fillister head
5. Round fillister head

(b) The length of the screw shall be defined as the distance from the largest diameter of the bearing surface to the extreme end.

(c) The form and size of head shall conform to forms and dimensions derived from formulas of A.S.M.E except for size of slot which shall be as follows:

Size of Screw	Width of Slot	Depth of Slot
0 to 2	0.024 in.	0.020 in.
3 to 6	0.030 in.	0.040 in.
8	0.042 in.	0.050 in.
10 to 12	0.051 in.	0.060 in.

With reference to square and hex. screw stock it was suggested that the effort of the Commission should be to assist in establishing the practice of having all screw stock run from basic to below basic, instead of basic plus or minus.

It is to be understood that the tolerances and allowances proposed for wrenches are to apply to open end wrenches only, socket wrenches are to be considered separately. The second suggestion would eliminate wrench sizes but requires different stock for bolts and nuts to be finished. George S. Case, of the Lamson & Sessions Co., does not feel that the A.S.M.E. sizes will cover all cases and proposed three series of nut dimensions. The first makes the nut the size of the bolt head—the second the size of the next larger bolt head and the third, the size of a bolt head two sizes larger. Mr. Case suggested the following dimensions to 1 in. Above that he suggests that the width across the flats be 1½ times the bolt diameter for both bolt heads and nuts. His proposed sizes are:

	Width Across Flats	
Size	Bolt Heads	Nuts
1/4	3/8	7/16
5/16	7/16	9/16
3/8	9/16	5/8
7/16	5/8	3/4
1/2	3/4	13/16
9/16	13/16	7/8
5/8	7/8	1
3/4	1–1/8	1–1/8
7/8	1–1/4	1–1/4
1	1–1/2	1–1/2

Diameter	Across Flats	Thickness
1/4	3/8	3/16
5/16	7/16	7/32
3/8	9/16	9/32
7/16	5/8	5/16
1/2	3/4	3/8
9/16	13/16	13/32
5/8	7/8	7/16
3/4	1 or 1–1/8	9/16
7/8	1–1/8 or 1–1/4	5/8
1	1–1/4 or 1–1/2	3/4

The makers of wood screws have eliminated many sizes and have adopted the same sizes of wire used in making machine screws.

Attitude of Secretary Hoover on the Metric System

While believing that the metric system can be applied to good purposes in the scientific field, there is reason to believe that Secretary of Commerce Hoover has in no way altered the opinion he has expressed on several occasions since assuming his portfolio. It is his opinion, that there is nothing to justify its general application at this stage of the country's development.

The period when productivity is important would be no time "to warp the brains of the country's mechanics" in their efforts to acquire the metric system, Mr. Hoover thinks. He thinks much of the propaganda for the metric system comes from a single indefatigable enthusiast.

America's Ability in Competition

The United States cannot hope to compete with the low-cost countries in the manufacture of the simpler forms of machinery which are not made on a large scale. There is increasing evidence, however, that this country can compete in any market with machinery which is made in large quantities and with such articles as machine tools, typewriters and locomotives. These are developments of American ingenuity and the actual control of their market will probably remain with this country.

The two great elements which will favor American industries are the use of labor saving machinery and the duplication of parts. Until foreign manufactures are equipped to use of these principles, we should enjoy an agreeable advantage.

Editorial

THE AVERAGE purchasing agent gets little sympathy and sometimes deserves less than he gets. But he is not to be envied when, with a falling or rising market, he is confronted with the problem: To buy or not to buy. If he makes a mistake, his company may be confronted with the problem: "To be or not to be."

What's Wrong with the Railroad Shops?

ONE OF THE MOST important of the several things that seem to us to be at the bottom of railroad shop inefficiency is the matter of equipment. In the second article of our series, which appears on another page, we have gone into the equipment situation with care.

To the average citizen the condition of railroad rolling stock is the indicator of the financial stringency that government regulation of an unintelligent character has brought about. Delays give striking evidence of motive power troubles.

To the engineer and others familiar with the shop, however, a much clearer picture of the lack of funds is presented by the antiquated and obsolete tools that are found in the railroad repair shop. With any semblance of a modern depreciation reserve policy these tools would have been written off the books years ago. As it is they represent a liability rather than an asset.

The statements regarding equipment must of course be taken as general statements. They apply to the majority of shops we have visited but not to all. A few are much better, others much worse.

Another point that is brought out in the article is the place of the "show machine" in the railroad shop. There are not very many machine tools that are built with railroad service first in mind. Axle and wheel lathes, wheel boring machines, slotters and draw-cut shapers are essentially railroad shop tools and are shown off to the visitor with pride. Unfortunately they are not always used efficiently as is indicated in the article. The inefficiency is due partly, of course, to the fact that mass production is unknown in railroad practice. With the wide variety of locomotives in the service of each road, standardization of parts and stocking of spares is out of the question. Here would be a most fertile field for Mr. Hoover's Division of Simplified Practice.

It is a great pity that the men in the railroad shops have had to contend with such adverse conditions. Even the most ambitious and aggressive man cannot but be affected by lack of money, lack of co-operation, lack of proper tools for his job. It is not our intention to try to blame anyone for the present situation, the causes are too complex. But it is our belief that a fair statement of the case will help to speed the coming of changes that must be made if our transportation system is to meet the requirements of the boom period of business prosperity which is just getting started.

Even the One-Man Shop Has a Large Engineering Department

QUEER AS IT may seem, the owner of even the smallest shop has at his command highly skilled engineering forces. All that he has to do to command their services is to ask their immediate employer for a price on the machine he builds and for a guaranty as to its production. Then he buys the machine and the tools necessary for the job and the engineering comes along. Sometimes he gets more—his machine set up and demonstrated, and a stack of parts machined.

Does he pay for the extras? Yes, and for more too. He pays a part of what it cost the machine builder to figure on a job for his neighbor who didn't buy. More than that, he pays a part of what it cost the same builder to figure on a half dozen other jobs that he didn't get. The builder has to get paid, so he distributes such charges over all the machines he sells.

If each customer asked for the services of the engineering force of one builder and then either bought or did not buy, the charges for such services might be distributed equitably. But if each customer asks for the services of six builders and buys from only one, five must go unpaid or collect from those to whom they do sell.

There isn't a good reason why the engineering knowledge of a manufacturer of milling machines, for example, shouldn't be used for the benefit of all performing milling operations. It is expert knowledge and, by its use, the most economical solution of milling problems can be secured in the shortest time. But the man who invokes the engineering services should pay for them whether he buys equipment or not. If he paid that way, it would cost him less in the long run and he would think twice before making indiscriminate use of an article so costly as engineering.

The Future of Radio

WIRELESS TELEGRAPHY has been with us for a great number of years, as we count time in days, when new inventions sprout, grow up, blossom and bear fruit in a fraction of a life time. Though admired and respected, it was never intimate or even on friendly terms with the mass of the population.

Wireless telephony, on the other hand, has taken the popular fancy by storm. Hundreds of thousands, perhaps millions, of radio sets have been made and sold. Radio has given rise to a new industry. It would seem, therefore, that it is about time to take stock of the situation and look into the future as well as we can.

Is radio a fad or a fixture? This same question has been asked about many other industries which have sprung up within the memory of the present generation. There were the bicycle and the automobile, the telephone and the typewriter, the phonograph and the moving pictures. About some of them we are not quite sure even now, but all of them were at one time at a stage where we doubted whether the rapid progress of the new in-

dustry was evanescent or lasting. Radio presents some phases which the other industries did not have and which make a prediction even more difficult.

That wireless telegraphy and telephony, as well as other uses of radio transmission of energy, have come to stay does not admit of any doubt. What is not so certain, however, is the extent to which they will keep a hold on the masses.

The pillars which are now supporting the structure of the industry furnishing the radio sets are the broadcasting stations. Such stations are under great expense to give the entertainment they are furnishing now. They are repaid by the expansion of the industry. As soon as this expansion is checked, it will be doubtful if broadcasting will continue as at the present, and if not, it is more than doubtful whether the same number of enthusiasts can be found which we find at present.

Besides, the radio is merely a novelty to many people, a new sensation, a kind of experiment with mysterious forces. When the novelty wears off there will be many who will no longer have use for the radio sets.

At best the music which is now delivered by the radio set is an inferior kind of phonograph noise. It is doubtful whether it will ever be possible to perfect the radio apparatus to such an extent that the music transmitted by it can be compared to what we hear in the concert hall or even at home. Between the mouth of the singer and the ear of the listener there are so many joints and connections, so many forces at work, so many possibilities for disturbance, that it is not reasonable to look for the perfection of transmission which comes when the voice is brought to us merely through the vibrations of the surrounding atmosphere.

The music which comes to New York from Pittsburgh is wonderful because of the way it got there, not on account of the quality. So also are we willing to listen to lectures given at a distant point, which if delivered in our home town would put us to sleep.

For all these reasons, it seems that we may expect a considerable slacking up of the popular interest. Maybe not now, maybe not in five years, but ultimately, unless some other use is found for radio, a use which is not only interesting but instructive and educational as well. It would seem that by proper co-operation among the great companies, perhaps jointly with state or federal government, much can be done along these lines and, if it were done, the popular interest would be maintained.

Shortly, if radio is to continue to live among the masses, it must be interesting on account of what it gives, not merely on account of its mystery.

High Cost of Distribution

FORTUNATELY, the problem of distribution is receiving more attention than formerly. Even the engineers who have hitherto devoted all their energies to reducing production costs another fraction of a cent per piece are beginning to study the question seriously. In the past they have been struggling only with the smallest item of the total cost of most manufactured articles, direct labor.

A glaring example of the high charge (whether it be all "cost" must be judged by each for himself) of automobile parts happened recently in a large eastern city. The owner of a well known car of distinction, if not exclusiveness, lost a small sheet metal cover which allowed the adjustment of the brake and served to keep dirt out in regular running. At the service station of the company building his car, he was charged two dollars for a new one, plus the labor of putting it on.

It so happened that this particular car owner was also a manufacturer of sheet metal goods and himself made these particular covers for the party who supplied the axles for the car. A dollar an ounce or thereabout seemed rather high for a plain sheet metal stamping and he had his secretary look up the price at which he supplied them to the axle makers for the car.

The books showed that his price on the piece, including material, labor, overhead, and the profit which enabled him to buy this car of distinction, was just eight cents. In going to the axle maker, from there to the car maker, and back to the service station in his own city, it had increased in cost from eight cents to two dollars, or twenty-five times. And yet they say that a rolling stone gathers no moss. It would seem as though the efficiency experts might well give the harassed production man a little time for even peaceful inefficiency and turn their energies to fields which offer so much greater opportunities.

Why Make Machinery the Goat?

AN EDITORIAL in the daily press calls our attention to the fact that a college professor has proved (to his own satisfaction) that many of our modern troubles are due to machinery. Hence, the argument runs, we should cast the machinery from us as an unclean thing and get along virtuously without it. The writer of the editorial is a little less drastic in that he can see a difference between good machinery and evil machinery and would have us keep the good but throw out the bad.

Here we have what seems to be almost the last step in passing the buck. From capital to labor, from labor to capital, to the manager, to the engineer, to the government bureau it has gone, and each has found a way to pass it along. But now it has been passed to an inanimate machine and how can the machine get rid of it?

Just why men who call themselves thinkers will persist in blaming machinery for the mistakes of management is beyond our comprehension. And yet they keep right on doing it. Granted that conditions in steel plants and manufacturing centers are not ideal, is it the fault of the machinery that men have built to do the heavy work for them? We can't see that it is and we are prepared to go a step farther and say that in many cases the bad conditions are at least partly due to the lack of machinery.

Just Suppose

JUST suppose you could hitch a taximeter on your salesman that would start working merrily when the P.A. sends out word he is busy. And suppose you could send a bill to the P.A. for all the money you lost while your salesman wasted his time because the P.A. was discussing the ball game or telling of his latest motor trip. Best of all, suppose you could collect the bill.

Be great wouldn't it? Ought to be done, of course.

But, just suppose you had to pay what the other fellow's salesman's taximeter said you owed him? Perhaps we'd all be more prompt and courteous—if it cost real money not to be? Can't be done? Possibly not, but—

Just suppose.

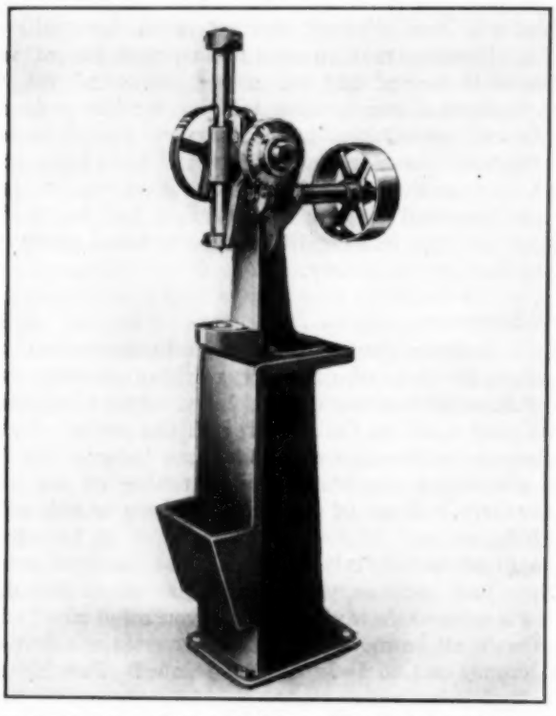
Shop Equipment News

American Broach & Machine Co. Bench Broach Press on Pedestal

A power-operated bench broach press mounted on a floor pedestal has recently been placed on the market by the American Broach & Machine Co., Ann Arbor, Mich. The machine, which is shown in the accompanying illustration, is similar to the vertical bench broach press described on page 695, Vol. 55, of *American Machinist*. It is intended especially for broaching small holes and keyways. The machine is rapid in its action, so that high production is obtainable.

The machine is operated by belt on a constant-speed pulley, and the power is transmitted through a steel worm and a bronze worm gear to the ram, which is operated by rack and pinion. The machine is fitted with an automatic stop, and the movement of the ram is controlled by a positive jaw clutch of hardened steel. The machine can also be operated by hand power, the handwheel having hollow spokes to receive a bar. A counterweight serves to raise the ram after the power has been disengaged. Approximately, 2 tons pressure can be obtained. The maximum stroke is 14 in., and work up to 6 in. in diameter can be handled. The table has a 2½-in. hole. The driving pulley is 10 in. in diameter and has a 3-in. width of face.

The pedestal shown has an oil receptacle which can be connected to an oil pump when required. The height to the top of the work table from the floor is 36 in. The machine complete with the pedestal as shown in the illustration weighs about 315 lb. Only a small floor space is required.



"AMERICAN" BENCH BROACH PRESS ON PEDESTAL

Bourquin "Leroy & Ames" Set for Draftsmen

Some pens and a lettering instrument for the use of draftsmen, engineers and those doing lettering and drawing work have recently been placed on the market by Edgar Bourquin, 1353 Main St., Waltham, Mass. The accompanying illustration shows set No. 100, although smaller sets including only that part of the apparatus required can be furnished.

The flap of the case that is shown raised in the illustration forms a pocket for holding the Ames letter-

"LEROY & AMES" NO. 100 SET FOR DRAFTSMEN

ing instrument that can be seen lying inside the cover of the case. This instrument consists of a nickel-plated steel frame holding a celluloid disk that may be rotated in it. In the disk are three parallel rows of tapered holes for drawing guide lines for lettering. The instrument is used by holding the base in contact with a T-square or straight-edge, and then pulling it alternately from right to left by a pencil placed in a hole in the disk, the position of the pencil being shifted from hole to hole after each movement across the paper.

The holes in the center row are evenly spaced, while the holes in one side row are spaced so that the bodies of the letters will be two-thirds of the height, and in the other row three-fifths of the height. The numbers on the edge of the disk indicate fractions whose understood denominator is 32, so that the total height of the letter is shown by the number opposite the mark on the base.

In the case are compartments for holding the pens,

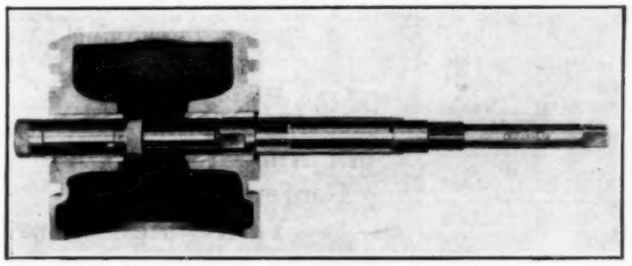
and a special celluloid holder for the Leroy tubular pens. These pens are adapted to both ruling and lettering. They are of the fountain type and are filled by means of a dropper such as ordinarily employed for ruling pens. In each tube is a cleaner that can be easily removed. The slight projection of the cleaner beyond the nose of the tube serves to constantly prime the pen. Movement imparted to the cleaner by the contact of its lower end on the paper, or by turning with the fingers from above, serves to keep the ink agitated so that it will flow, and to remove hardened particles that tend to clog up the point. The ink is retained even when the cup is full, so that it does not drop from the point when the pen is lifted. The width of the line made depends upon the width of the point, so that a range of sizes of pens is furnished. The width of line is easily controlled, as it is always the same for any one point.

The tube points are interchangeable in a swiveling socket, in which they can be locked in such a position as to make the position of the holder most convenient for the user. The same socket can also be employed for holding Gillott's crow quill pens, one of them being shown clamped in position and lying in a tray in the box. The case for the No. 100 set is 4½ x 3 x 1 in. in size, leather covered and lined with plush.

"Nu-Angle" Expansion Line Reamer

The Vedoe-Peterson Co., Norfolk Downs, Mass., has just placed on the market the "Nu-Angle" expansion line reamer for reaming piston-pin bushings. The tool is similar in construction as far as the arrangement of the blades is concerned to that described on page 162 of *American Machinist*. It has six blades placed at angles to the axis so as to minimize chatter and gouging. Regardless of the size of the reamer, it can be adjusted through a range of 0.030 in. Thus accurate control of the size of the finished hole is possible, and either standard or oversize pins can be fitted.

The tool is equipped with a pilot and an expanding sleeve, so that the two holes in the bushing will be exactly aligned. Throughout the whole reaming operation, the tool is guided and supported by the solid pilot and the expanding sleeve in one bearing while reaming the opposite bearing.

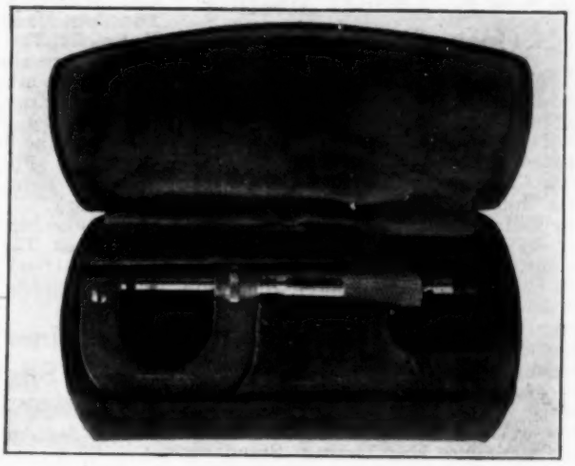


"NU-ANGLE" EXPANSION LINE REAMER

The reamer is made in nine sizes capable of reaming piston-pin bushings in practically every make of automobile. The diameter available ranges from 0.66 to 1.14 in., and the length over all from 9½ to 12½ in. Three reamers can be furnished to ream the piston-pin bushings employed in the great majority of automobile motors. The tools are packed in wooden boxes equipped with compartments to hold them in place.

Brown & Sharpe Pocket Micrometer Case

The accompanying illustration shows a case that fits the pocket, and that has recently been placed on the market by the Brown & Sharpe Manufacturing Co., Providence, R. I., for holding 1-in. micrometer calipers. The principal feature of the case is its shape, as it is designed to fit the pocket without taking up much room or causing a large bulge, as might occur with the ordinary case. Its use protects the micrometer from dirt and injury due to carrying in the pocket.



BROWN & SHARPE POCKET MICROMETER CASE

The case is made of metal, covered with leather and lined with plush. It is furnished in two styles, the No. 202 for the standard micrometer made by the concern, and the No. 203 for the "Rex" micrometer. The inside of the case is so shaped as to hold the micrometer securely in position and prevent it from moving in the case.

Moving Machinery as per Schedule

As is generally known, parts of the Ford works are being moved from Highland Park to the River Rouge plant and thereby hangs a tale which may well be noted, and copied. The moving isn't done in a haphazard manner but as per schedule. The time came to move a certain group of machines of the cylinder block group. The machines ran at Highland Park until the moving men backed a truck up to receive the machines, then the men put on their hats and coats, checked out and took a street car, or cars, for the River Rouge plant.

It is a long way from one plant to the other, especially by street car, and it's several miles even as the truck flies, to paraphrase an old saying. But they finally arrived and when they reported to the foreman, their machines were already in place, wires were connected and all they had to do was to put in a piece of work and throw on the current. Needless to say the men were surprised, as is everyone who hears it. But though it might seem like a miracle to most shops, it is not only possible but it actually happened. And all because the moving was planned and carried out systematically.

Incidentally it was made easier to have the machines ready to run by the time the men arrived, due to the independent motor drives with which the machines were supplied.

Some moving!

News Section

A.S.M.E. Annual Meeting Opens December 4

The annual meeting of the American Society of Mechanical Engineers, the biggest of the national engineering gatherings of 1922, will be held in the Engineering Societies Building, New York City, December 4 to 7. At that time John L. Harrington of Kansas City will succeed Dean Dexter S. Kimball of Cornell as president of the society.

A feature of the meeting, which will attract engineers, manufacturers, economists, educators and industrialists from all over the country, will be joint sessions with the American Economic Association, the American Society of Safety Engineers, the American Society of Refrigerating Engineers, and the American Engineering Standards Committee.

H. F. Loree, president of the Delaware and Hudson Railroad Co., and E. M. Herr, president of the Westinghouse Electric and Manufacturing Co., will be among the speakers at the economic forum, at which addresses also will be delivered by Dr. W. C. Mitchell of the National Bureau of Economic Research, and professor of economics at Columbia University; Prof. H. H. Seager of Columbia, president of the American Economic Association, and Dean Kimball. Mr. Herr's topic will be "The Human Problem in Industry." Prof. Mitchell will discuss "Making Money and Making Good."

Taylor Society Will Hold Three-Day Session

The Taylor Society will open its 1922 Annual Meeting in the Engineering Societies Building, 29 West 39th St., New York City, on Wednesday evening, November 22, with its annual dinner at 6 o'clock. This will be followed by the annual business meeting.

The sessions of Thursday, November 23, will be given over to a discussion of the following papers by the authors named:

The Organization and Management of a Medium-sized Plant: emphasis on manufacturing organization and management, by Percy S. Brown, Works Manager, Corona Typewriter Co., Groton, N. Y.; Statistical Compilation —some of its uses as a function of scientific management, description of a statistical department, its organization, equipment and product, and the use of the latter in managerial control, by Harry B. Horwitz, Planning Department; Harry A. Wembridge, Statistical Division; and Herman J. Hutkin, Methods Division; The Joseph & Feiss Co., Cleveland; Shaping Your Management to Meet Developing Industrial Conditions, by H. S. Person, managi..g director, Taylor Society, New York.

The program for November 24 is as follows: Master Budgets of Sales and Production; Case 1—The Hood Rubber Co., by W. W. Duncan, Hood Rubber Co., Watertown, Mass.; Case 2—The Dennison Manufacturing Co., by Ernest E. Brooks, The Dennison Manufacturing Co., Framingham, Mass.; Reduction of Waste through Research Studies in the Operating Departments of Retail Stores —a summary of results of recent studies made by the Retail Research Association. By Philip J. Reilly, associate director, Retail Research Association, New York.

The evening session will be a Symposium on The Supervision of Personnel, the trend following the shock of the depression.

Machinery Exports Show Slight Increase

Exports of metal-working machinery during September were slightly greater than in August and materially greater than the value of the exports in September, 1921. September exports were valued at $1,093,891, as compared with $1,032,483 in August of this year and $1,074,371 in July. The detailed figures, which are those of the Bureau of Foreign and Domestic Commerce, are as follows:

EXPORTS METAL-WORKING MACHINERY

	August, 1922	September, 1922
Lathes	$52,963	$54,874
Boring and drilling machines	31,370	40,628
Planers, sharpeners and slotters	11,980	15,758
Bending and power presses	16,061	11,085
Gear cutters	15,290	14,667
Milling machines	27,631	29,662
Sawing machines	3,145	5,041
Thread cutting and screw machines	13,530	22,924
Punching and shearing machines	6,735	7,171
Power hammers	10,534	20,886
Rolling machines	734	3,897
Wire-drawing machines	1,665	81
Polishing and burnishing machines	396	1,265
Sharpening and grinding machines	79,356	56,468
Chucks, centering; lathe, drill and other	23,566	18,676
Reamers, cutters, drills and other parts for machine tools	100,295	114,475
Pneumatic portable tools	44,772	35,389
Foundry and Molding machinery	70,228	44,436
Other metal-working machinery and parts of	522,232	596,508
Total metal-working machinery	$1,032,483	$1,093,381
IMPORTS		
Machine tools	$18,926	$20,950

A.S.T.M. 1923 Annual Meeting

The Executive Committee of the American Society for Testing Materials has voted to hold the 1923 Annual Meeting of the Society at Atlantic City in the latter half of June provided satisfactory arrangements can be made. Two dates are tentatively under consideration, viz.; (1) during the last week in June, *i.e.*, June 25 to 29 and (2) immediately following the meeting in Atlantic City of the American Railway Association, *i.e.*, about the middle of June. Announcement of the exact date will be made in these columns as soon as a definite decision is reached.

A.S.M.E. Elects Division Committees

The American Society of Mechanical Engineers, during the past week, announced the elections of the executive committees of the professional divisions. Among the committees selected are the following:

Machine Shop Division: F. O. Hoagland, Worcester, Mass.; Henry J. Eberhardt, Newark, N. J.; Forrest E. Cardullo, Cincinnati, Ohio; George E. Greenleaf, Plainfield, N. J.; and Charles R. Gabriel, Brooklyn, N. Y.

Management Division: R. A. Wentworth, chairman, W. Herman Greul, Alonzo Flack, L. P. Alford and Robert T. Kent, New York City.

Materials Handling Division: H. V. Coes, Philadelphia, Pa., chairman; Fred M. Feiker and R. M. Gates, New York City; Kern Dodge and H. E. Birch, Philadelphia, Pa.

Ordnance Division: Waldo H. Marshall, New York City, chairman; Lieut. Col. G. L. Wall, Aberdeen Proving Grounds, Aberdeen, Md.; Major Wilford J. Hawkins, Bloomfield, N. J.; Col. C. L'H. Ruggles, Ordnance Department, Washington, D. C.; and Major Fred J. Miller, New York City.

Power Division: John H. Lawrence, New York City, chairman; Ervin G. Bailey, Cleveland, Ohio; A. G. Christie, professor of mechanical engineering at Johns Hopkins University, Baltimore, Md.; C. F. Hirshfeld, Detroit, Mich.; and Nevin E. Funk, Philadelphia, Pa.

Railroad Division: James Partington, New York City, chairman; William Elmer, Altoona, Pa.; E. B. Katte, New York City; W. H. Winterrowd, Montreal, Canada; and Burton P. Flory, Middletown, N. Y.

Aëronautic Division: Major Thurman H. Bane, U. S. Air Service, McCook Field, Dayton, Ohio, chairman; Joseph A. Steinmetz, Philadelphia, Pa.; Elmer A. Sperry, Brooklyn, N. Y.; Lieut. R. S. Barnaby, U. S. Navy, Philadelphia, Pa; and Sanford A. Moss, Lynn, Mass.

6th Annual Industrial Conference of New York State

"Elimination of Waste in Industry" will be the central theme of the Sixth Annual Industrial Conference of the State of New York which will be held in Buffalo, Nov. 21, 22 and 23, at the Hotel Lafayette.

Among the speakers on the program who will address the conference are the following: Hon. Henry D. Sayre, Industrial Commissioner; Governor Nathan L. Miller; W. D. Baldwin, Chairman of the Board, Otis Elevator Co.; L. W. Wallace, Vice Chairman, Federated Engineering Societies; M. F. Simmons, General Electric Co.; H. C. Blagbrough, H. H. Franklin Co.; Dean Dexter F. Kimball, Cornell University, and W. R. Bassett, Miller, Franklin & Bassett Co.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE economic effect of the election is quite as important as the political realignment that it will bring about. Some maintain that the reduction in the Republican vote was due simply to popular petulance at the failure of Congress to reduce taxes and expenditures. Others assert that it reflects a widespread demand for a policy that will equalize the inequalities of life and correct the alleged unfairness with which the rewards of human effort and enterprise are distributed in this wonderful country of ours.

In our consideration of the subject we shall probably be led astray if it is assumed that the masses are much concerned about taxation or government expenditure. The only direct Federal tax is that levied upon incomes. In 1920 there were but 226,120 persons who reported taxable incomes of as much as $10,000 or more. This is a politically negligible portion of the population and while the rest of the people resent the fact that so much of the country's wealth is concentrated in the hands of the few they take a certain satisfaction in the belief that these few pay most of the taxes and in this belief the many are not acutely conscious of the burden of indirect taxation that is passed on to them.

Corroborative evidence of this statement is furnished by the election in the State of New York, where the candidate whose chief recommendation was his economy went down to defeat.

Nor will the careful student of the political map be inclined to agree with those who assert that the tariff was a major influence in the election. The democratic papers succeeded in making something of a bogey of it, but it has not been long enough in force to increase seriously the cost of living and while it has its iniquitous aspects the average American voter is not much moved by economic abstractions. His grievances must become concrete before he is willing to abandon his party affiliations to protest against them and it can hardly be said that the higher prices which must ultimately be the result of the higher duties have as yet become painful realities.

We may therefore conclude that the changed majorities were not so much a protest against taxation or extravagance or the tariff as against the inequalities of economic opportunity and rewards of which the social reformers talk so much.

The outstanding fact of the election is the triumph of the Progressives. Its explanation is to be found in the promises they made. In nearly every case they pledged themselves to improve the economic condition of the large majority of the people who feel themselves oppressed. In the agricultural states the elected candidates were those who promised higher prices for the products of the soil. In the industrial regions the nominees who were supposed to be in sympathy with the wage earners got the largest vote and in the State of New York the enormous majority given to "Al" Smith is generally interpreted as a protest against the power of wealth that Governor Miller is rightly or wrongly supposed to represent.

The net result of the election is that the balance of power in both houses of Congress as well as in several state legislatures will be held by a few men who are known to be anti-capitalistic in their views.

The outstanding fact of the election is the triumph of the Progressives. Its explanation is to be found in the promises they made. In nearly every case they pledged themselves to improve the economic condition of the large majority of the people who feel themselves oppressed.

A Coalition of the newly elected Representatives and Senators who call themselves Progressives with the Agricultural "Bloc" will bring into existence a minority unit than can hold up all legislation of which it does not approve. Some of the members of this unit are already on record as interpreting the vote cast last Tuesday into a demand that farm and industrial labor shall be awarded a larger and more equitable share of the wealth that it produces. This means that capital will get less. The justice of this demand need not be here discussed, nor is it possible to say whether it can be successfully resisted by those who may oppose it. The indications are that an attempt to meet it by legislation will probably be made, and if this attempt is made it is likely to prove a disturbing if not a depressing factor in so far as security values are concerned.

Conversely, it is likely that the Progressives will regard themselves as commissioned to find a way to raise wages as well as the prices of farm products. If this is attempted a further advance in both raw materials and manufactured articles may be expected until the law of supply and demand, which is superior to man made statutes, reasserts itself.

But it is not to be expected that these prophetic generalizations will immediately become realities. The newly elected Congress will not meet until the fourth of March and while the special session of the old Congress that has been called by the President will convene November 20th, it is unlikely that it will venture to increase its unpopularity by enacting the Ship Subsidy bill or any other legislation that will involve further demands upon the treasury or the tax-payer.

A winter of comparative quietude politically and financially is therefore indicated. The impetus which the business improvement now in progress has acquired ought not to be exhausted before the spring.

The developments of the past week have not been specially important except in the cotton market, where the feeling of alarm at the prospective scarcity in the world's supply of the raw material has led to a further advance of over two cents. No one knows at what price the advance will be checked.

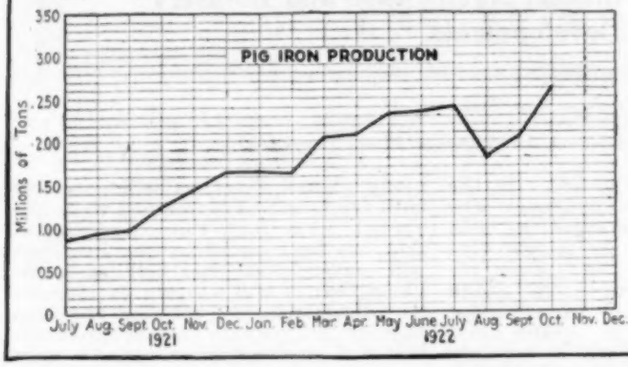
The other two important textiles, silk and wool, are likewise firm, but in no other department of our domestic trade is the upward tendency of prices as pronounced as it was two or three weeks ago. The market for building material is distinctly easier because the railway congestion has led many builders to suspend operations for the winter or until they can get prompter delivery of the supplies they need.

The market for bonds and stocks has changed but little since Wednesday, when it opened at a slight decline upon the news of the elections and promptly recovered the ground lost because the outside public did not seem disposed to follow the lead of the professionals in selling. The money market has been quiet. It is firm but not appreciably higher. The weekly statement of the Federal Reserve System shows a gain of $2,700,000 in the gold held and an advance of ⅛ of one per cent in the reserve ratio, which now stands at 76.4.

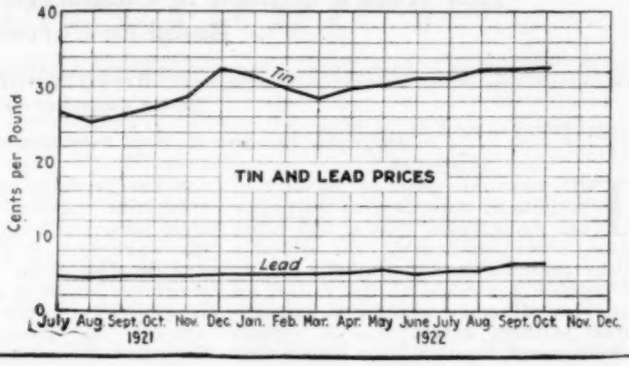
The continued decline in French and Belgian francs has been a feature of the foreign exchange market. It is attributed to the gradual abandonment by France of the hope that she will collect any substantial portion of the reparations claimed from Germany whose paper marks are practically worthless at 1¼ cents a hundred.

There are but few other European developments that call for comment. The Turks are again becoming turbulent but England seems undisturbed. Despite the financial plight of the various continental governments private business in Europe appears to be on the mend and Russia in particular seems to be commencing to emerge from its economic disorder now that the Soviet government has countenanced the resumption of trade and consented to a partial recognition of the rights of capital.

Monthly pig iron production of all coke and anthracite furnaces in millions of tons, based on returns compiled by the American Iron and Steel Institute.



Monthly average price of tin and lead in the New York market, based on returns furnished by Engineering and Mining Journal-Press.



PIG IRON production advanced sharply during October the output for the month totaling 2,633,840 tons as compared with 2,003,722 tons in the month previous. The October production represents the largest tonnage reached in any single month since December, 1920, at which time 2,703,855 tons were manufactured. The increase of 30 per cent over September is the largest gain recorded in any single month since March, 1918. During the month there was an increase of 29 stacks in operation, a total of 218 being in blast on November 1st, the first time during the year the figure has exceeded 200.

Tin and lead prices were strong and higher during the month as compared with the average for September. The average for the former was 33.935 cents as against 32.134 cents while lead averaged 6.530 as compared with 6.110 cents in September. Toward the end of the month both metals were affected by increased activity with higher prices resulting, but the activity has been of a speculative character. There is no scarcity of either metal, reputable consumers being able to secure their requirements.

Automobile share markets worked higher during October, ten representative issues moving up to an average of $46.52 per share as compared with $45.65 in September. The high point in the movement which began in August was reached about the middle of October with an average of $47.60 per share. Since that time there has been a gradual decline, the average price on October 30 reaching $45.00. Seasonal falling off in demand has been the chief weakening factor.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

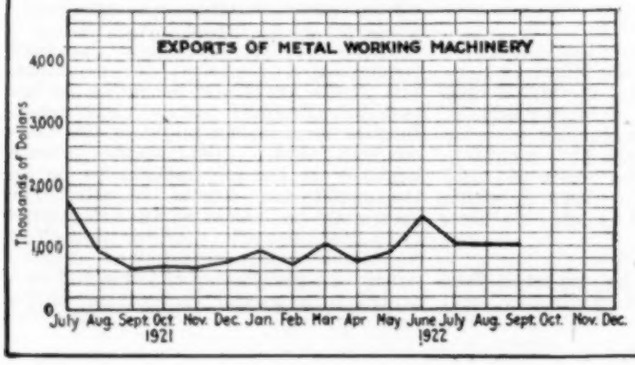
	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.....	$0.0295	$0.0295	$0.0273
Cold finished shafting.....	per lb.....	0.0378	0.0378	0.0373
Brass rods.....	per lb.....	0.171	0.1700	0.15
Solder (½ and ½)	per lb.....	0.24	0.23	0.20
Cotton waste..	per lb.....	0.11	0.11	0.122
Washers, cast iron (½ in.)...	per 100 lb.	4.33	4.33	4.33
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100.....	3.11	3.11	.....
Lard cutting oil	per gal.....	0.59	0.575	.....
Machine oil....	per gal.....	0.36	0.36	.....
Belting, leather, medium.....	off list.....	30–10% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list.....	55% @60%	50%@ 65–10%	50%@ 60–10%

Metal working machinery exports continue to hold up well, September shipments being valued at $1,093,891, a slight increase over the August total of $1,032,483. This is the highest total recorded during the current year and compares with shipments in March valued at $1,057,106 and July, valued at $1,074,371. As compared with the month of September, 1921, the figures show an increase of $467,705. Imports of tools continue in small volume and were valued at $20,950 as against $18,926 in August. Machinery exports to South America are increasing but industrial, and financial conditions in Europe must improve considerably before any great impetus can be expected in metal working machinery exports on the whole.

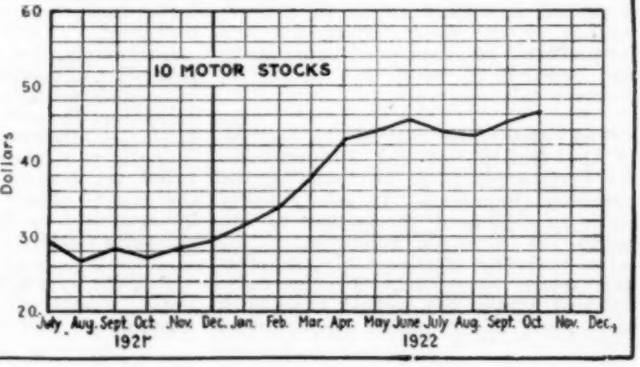
American foreign trade for September shows exports valued at $307,457,198 and imports of $228,794,639, as against August exports of $301,804,618 and imports of $281,412,910. As compared with September, 1921, imports show an increase of nearly $50 millions while exports declined about $10 millions.

Railway earnings on American roads increased slightly during September, Class One railroads reporting a net operating income of $58,428,000 as against $52,579,799 in the month previous.

Total value of all metal working machinery exported monthly from the United States, based on returns compiled by the Bureau of Foreign and Domestic Commerce.



Average price of ten automotive stocks: Chandler, General Motors, Hupp, Int. Motors, Pierce, Stewart, Stromberg, Studebaker, White, Willys.



Alabama to Be Center of Pipe Industry

According to a recent bulletin by the Southern Metal Trades Association establishment of several new pipe plants in the Birmingham district the past several months has resulted in making that district the largest manufacturer of cast-iron pipe in the world, with Birmingham and Anniston, Ala., the two larger centers. In the latter city there are about fifteen large plants manufacturing pipe, while Birmingham has the largest individual pipe plant in the world. This plant produces approximately 13 per cent of all cast iron pipe made in the United States. More than 50 per cent of all pressure and soil pipe made in this country is produced in the district.

Plan Exhibit of Inventions and Patents

Announcement has just been made by A. B. Cole, vice-president of the Universal Patent Exposition Corporation, with executive offices at 110 West 40th St., New York City, of an exposition of inventions and patents to be held in Grand Central Palace, in that city, February 17 to 22, 1923.

The object of the exposition is to give all inventors an opportunity to show the public, the manufacturer, the merchant, and the financier the possibilities for utility, business, trade and commerce that are to be found in the products of their genius.

The opening day of the exposition, Saturday, February 17, has been named International Day, each of the five days following being named in honor of Marconi, Steinmetz, Edison, Bell and Westinghouse.

Freight Loadings Make High Record

Loading of revenue freight during the week which ended on Oct. 28 amounted to 1,014,480 cars, according to reports received today from the railroads of the country by the Car Service Division of the American Railway Association.

This was the largest number of cars loaded with revenue freight during any one week in the history of the railroads, except for the week of Oct. 15, 1920, which exceeded this total by only 4,059 cars, or two-fifths of one per cent. This also was the second consecutive week that freight loadings have exceeded the million mark.

Loading for the week of Oct. 28 this year was an increase of 10,721 cars over the week before, and an increase of 63,096 cars over the corresponding week last year. It also was an increase of 33,238 cars, or 3.4 per cent above the corresponding week in 1920 when the total was 1,008,818 cars.

While the total loading for the week was slightly below that for the week of Oct. 15, 1920, which was the largest on record, an analysis shows that there is a more widespread stimulation in business now than two years ago. The seasonal decline in loading usually begins around Oct. 15, but comparisons show an increase in the loading of agricultural products and all other commodities as well.

Bad Order Locomotives Show Decrease

Reports received last week from the railroads of the country by the Car Service Division of the American Railway Association show a steady improvement in the condition of motive power belonging to all carriers.

On Oct. 15 last, 19,231 locomotives, or 29.8 per cent of the total on line, were in need of repairs, according to these reports.

This was a reduction of 496 locomotives during the first half of October, there having been 19,727, or 30.6 per cent, in need of repairs on Oct. 1.

Of the total number on Oct. 15 last, 15,935 were in need of repairs requiring more than 24 hours. This was a decrease since Oct. 1 of 378 locomotives in the number requiring heavy repairs. Reports also showed 3,296 locomotives in need of light repairs which was a decrease of 118 within the same period.

At the same time the railroads of the United States had on Oct. 15, 45,187 serviceable locomotives compared with 44,703 on Oct. 1, an increase of 484.

From Oct. 1 to Oct. 15, 11,404 locomotives were turned out of the shops. This was an increase of 191 over the last half of September.

French Steel Industry Improving Rapidly

Commercial Attache Jones, in a cable to the Department of Commerce, reports marked and continued improvement in the French iron and steel industry.

During the first eight months of 1922, France produced 3,136,000 metric tons of pig iron and 2,809,000 metric tons of ingot steel. There were 98 blast furnaces active on the first of September, 61 furnaces ready to operate, and 62 furnaces being constructed or repaired. The general condition of the iron and steel industry is continuing to improve, due especially to a lack of German competition. Depreciation of the franc favors exports, but domestic demand is slightly calmer. Prices are firm or rising. Producers have orders several weeks ahead, and stocks are low, particularly those of pig iron and semi-finished products.

Strong Tendency Marks Southern Iron Market

According to the Southern Metal Trades Association the iron market in the Birmingham district still is at comparatively high prices though there is a very noticeable tendency for the prices to ease off. Many of the makers that were asking $30 a week or ten days back have reduced to $28 in the competitive fields, while the market can be said to stand at $27.50 to $28 per ton. Further slight reductions are looked for and in another week average prices probably will be around $27. Excellent sales still are reported, with the outlook better than it has been in many months. Many manufacturers in the district look for 1923 to usher in another period of inflation, but expect conditions to hold stable enough that the disastrous after effects will not prevail such as followed the last period immediately after the war.

Steel Production in South Africa Growing

Steel production in South Africa is making considerable progress, according to a report to the Department of Commerce from Trade Commissioner Stevenson, though not as much as had been anticipated.

The Union Steel Corporation (of South Africa) Limited, Mr. Stevenson says, is by far the most important factor in the industry, its 1921 production being 14,434 tons of a value of £361,468. The greater part of the output, or 11,573 tons, consisted of open-hearth steel made from scrap materials, while 2,861 tons were made in a 3½-ton Heroult electric furnace. A new 22-inch mill is being installed to roll heavier sections of angles, channels, girders, and similar products from 20 to 30 pounds per foot, and rails up to 60 pounds per yard. A new 25-ton Siemens open-hearth furnace has been erected and when in full working order the capacity of the works will be 30,000 tons a year. The Union Steel Corporation has already supplied a large part of the reinforcing steel contract for the government grain elevators, and has rolled a few rails which have been purchased by the South African Railways for trial purposes.

The Dunswart Iron and Steel Works, Limited, turned out 5,355 tons of iron, valued at £123,165 in 1921. A new 3-roll high 18-inch cogging mill is in the course of erection. It is intended later to manufacture steel castings up to 7 tons in weight.

The Witwatersrand Co-operative Smelting Works, Limited, has erected a new plant at Driehoek, to which the old equipment is being transferred. The capacity of the new plant will be 4,500 tons per annum. The 1921 output was 1,296 tons of shoes and dies, worth £25,900, as against 1,201 tons in 1920, valued at £24,020.

The South African Iron and Steel Corporation, Limited, at Pretoria, was able to operate only during the first four months of 1921, the output being 1,148 tons of pig iron, valued at £11,480, which was slightly below the 1920 figures.

It would appear, Mr. Stevenson concludes, that the local industry has not as a whole made the progress that was anticipated, even allowing for the depression period. Whether the new Iron and Steel Industry Encouragement Act will prove sufficiently attractive to interest capital is open to some question.

Jones & Laughlin Assisting Carnegie Tech Students

To assist students working their way through Carnegie Institute of Technology, the Jones & Laughlin Steel Co., of Pittsburgh, has arranged to employ students in the steel mills on Friday and Saturady nights or all day Saturday. The shifts are of ten hours length.

Jones & Laughlin Co. is the first large concern in Pittsburgh to come to the aid of students in need of finances. The arrangement is pleasing to the administration at Carnegie Tech because of the opportunity it gives to the students in the College of Engineering to acquire practical as well as theoretical knowledge.

Westinghouse Makes Personnel Changes

A number of changes in the personnel of the district offices of the Westinghouse Electric and Manufacturing Co. have been announced by W. S. Rugg, general sales manager of the company.

In the Pittsburgh office, the power division has been changed to the central station division with Barton Stevenson as manager. Mr. Stevenson will also be in charge of the sale of supply apparatus throughout the entire Pittsburgh district. The railway division has been changed to the transportation division, with F. G. Hickling as manager. A merchandising division has also been organized of which F. C. Albrecht has been appointed manager.

A transportation division has been organized in the Philadelphia office and Thomas Cooper has been appointed manager. A central station division has also been organized with H. L. Moody as manager. Mr. Moody will also be in charge of the sale of supply apparatus in the Philadelphia district, assisted by H. F. Brinckerhoff, who has been appointed assistant manager of the central station division. W. P. Cochran will temporarily have charge of the merchandising division, which has been newly formed.

Similar changes have also been made in the Detroit office. A central station division has been established with L. Whiting as manager. Mr. Whiting will also have charge of the sale of supply apparatus. F. D. Koelbel has been made acting manager of a newly created merchandising division. A transportation division has been established with R. L. Hermann as manager.

Changes in address have been made by the St. Louis and Los Angeles offices. The former office is now located at 717 South Twelfth St., St. Louis, and the latter at 420 South San Pedro St., Los Angeles.

Business Items

The Simplex Wire and Cable Co., of Boston, announces the establishment of a branch office in New York City at 120 West 32d St., with Joseph G. Brobeck as manager. Mr. Brobeck has sold Simplex wires and cables in the New York territory since March, 1920, previous to which he was connected with the Simplex sales organization at Boston for nineteen years.

The Reed-Prentice Co., Worcester, Mass., is to sell the Whitcomb-Blaisdell Machine Tool Co. factory on Gold St., Worcester, and will distribute the work in the other plants of the company in Worcester. The Becker Milling Machine Co. plant at Hyde Park, Mass., will be removed to Worcester, and the Hyde Park property sold. The Becker plant has been controlled by the Reed-Prentice interests for a number of years.

The Parker Metal Goods Co., of Worcester, Mass., has recently been incorporated under the laws of Massachusetts, with a capital stock of $50,000, to manufacture and deal in metal products, specialties, etc. Arthur H. Parker, 3 Roseland Road, Worcester, has been elected president and treasurer of the company.

The Manufacturers Machine Tool and Supply Co., Inc., of Bridgeport, Conn., has recently been incorporated under the laws of Connecticut, to engage in the handling of machine tools, machinery, and mill supplies, etc. The capital stock is $50,000, and the incorporators are: T. Leo Lalley, 647 Water St.; Ambrose A. Johnson, and Albert E. Wright, all of Bridgeport.

Alvord Reamer and Tool Co., Millersburg, Pa., announces the appointment of Paul A. Cuenot as mechanical representative to furnish special tool service to customers. Mr. Cuenot was formerly connected with the American Locomotive Co. and the Pennsylvania Steel Co.

The Black & Decker Manufacturing Co.'s Philadelphia branch office and service station, formerly located at 318 North Broad St., has re-located, the new address being 824 North Broad St. The new quarters are much more commodious and up-to-date than the old ones.

The Mack Trucks, Inc., for the quarter ended Sept. 30, 1922, reports net earnings of $1,205,733, after deducting charges for maintenance, depreciation, repairs, etc., compared with $12,633 earned during the same period last year.

The Hudson Motor Car Co. for the quarter ended August 31, 1922, reports a net income of $3,656,218, after Federal taxes, or more than $3 a share on the outstanding capital stock. The income account for the quarter showed profits of $4,183,327; reserve for Federal taxes, etc., $527,109; net income, $3,656,218; dividends, $600,247, and a surplus of $3,055,971.

The United States Hoffman Machinery Corporation for the quarter ended Sept. 30, 1922, reports gross sales of $1,528,241, against $1,381,200 in the previous quarter. Net income, after all expenses, but before taxes, totaled $255,435, against $214,984 in the previous three months.

The Seneca Falls Manufacturing Co. of Seneca Falls, N. Y., makers of machine tools and specializing in lathes has been placed in the hands of a receiver by Federal Judge Cooper. Kenneth Bartlett, assistant treasurer of the corporation and William McGreevy of Geneva have been appointed receivers. The petitions filed in Federal court show assets of $673,000 and liabilities of $238,000. The liabilities largely consist of bonds involving $210,000 held by banks and protected by real property said to be worth considerably in excess of the total debts. The capital of the company comprises $500,000 in preferred stock and 15,000 shares of common stock of no par value. The report shows that the business of the company during 1921 and 1922 has been about ten per cent of normal.

The Harrisburg Bar Mill plant, owned by J. K. White, has been purchased by the Harrisburg Pipe and Bending Co., and will be operated by the new firm. E. C. Frey is general manager and treasurer of the Harrisburg Pipe and Bending Co., Harrisburg, Pa. No immediate changes are contemplated.

The Reliance Gauge Column Co., Cleveland, Ohio, announces that its Cleveland Clutch business has been sold to The Western Engineering and Manufacturing Co., 360 E. Grand Ave., Chicago, Ill., which has been incorporated as a subsidiary of the Western Valve Bag Co. for the purpose of taking over the manufacture and marketing of this clutch.

The M. and H. Piston Ring Co., capitalized at $100,000, has filed articles of incorporation with the county clerk in Oakland, Cal. The directors are: John and Charles I. Chartz, Chas. A. McCharles and R. C. Savage, all of Carson City, Nevada.

The Cleveland Twist Drill Co. announces the retirement on November 1, of E. G. Buckwell, secretary and sales manager of the company.

The Scovill Manufacturing Co., manufacturer of brass goods, etc., Waterbury, Conn., is planning the increasing of its capital stock from $5,000,000 to $15,000,000, the amount of increase to be divided into 100,000 shares of $100 par value each. The authorization of the increase was granted the company at the last session of the State Legislature.

The Wm. H. Field Co., machinery dealer, 39 Washington St., North Boston, Mass., is erecting a large one-story 60 x 250 brick and frame machinery warehouse for its own use on Dorchester Ave., South Boston.

The Bee Machine Co., of Lynn, Mass., has recently been incorporated under the laws of Massachusetts, to conduct a general machinist business. The capital stock is $15,000, and the officers chosen are: Frank S. Belliveau, president; Melvin P. Rhodes, vice-president; and Vincent W. Burke, of 32 Baker St., Lynn, treasurer.

The Dunbrack Tool and Die Co., of Waltham, Mass., has recently been incorporated under the laws of Massachusetts, with a capital stock of $20,000. Warren H. Dunbrack has been elected president; and Norman K. Dunbrack, Prospect Hill Ave., Waltham, has been elected treasurer.

Charles J. Britt, of Wilmington, S. C., and P. T. Jones, Jr., of Corinth, Miss., are engaged in the formation of a company that is to establish a plant, probably at Wilmington, for the manufacture of a new traction engine and tractor recently invented and patented by Mr. Britt.

The Norwalk Iron Works Co., pioneer builder of compressors, manufacturing air and gas compressors for all purposes and also refrigerating machinery, with general offices and works, South Norwalk, Conn., has just opened a Chicago office. It is located at 627 W. Washington Boulevard and is in charge of L. R. Bremser who, for thirteen years, was associated with The Gardner Governor Co.

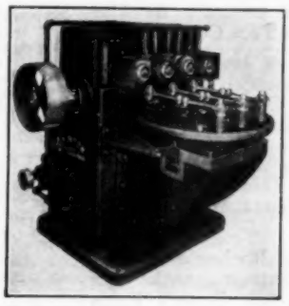
The Cleveland Twist Drill Co., announces the appointment of W. E. Caldwell, formerly assistant sales manager, to the position of sales manager to succeed E. G. Buckwell, recently retired.

The Inopco Corporation has been organized and incorporated in Atlanta with $200,000 capital, to establish a plant in that city for the manufacture of machinery used in the extraction of

Condensed-Clipping Index of Equipment

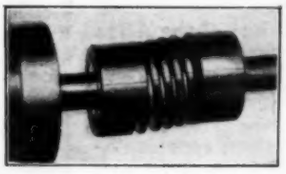
Patented Aug. 20, 1918

Milling Machine, Four-Spindle, Knee-Type, Model C-76
Consolidated Machine Tool Corporation of America, New York, N. Y.,
Newton Machine Tool Plant, Philadelphia, Pa.
"American Machinist," September 28, 1922



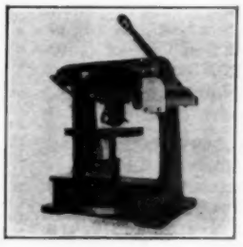
The machine is intended for facing and slotting connecting rods in one operation and at high speed. The drive is by belt transmitted directly to the spindles by worms and wormwheels. The four spindles have tapered ends and individual adjustment for varying the distance between the spindle centers. The vertical feed of the table gives a quick upward movement to the knee, and changes to a slow feed for the cut and then to a quick downward movement after which it automatically stops, allowing the table to be indexed. Each fixture has an individual adjustment for varying the distance between the rods. Floor space, 60 in. square.

Coupling, Shaft, Flexible, Cut-Spring
Steel-Flex Coupling Corp., 1712 First National Bank Bldg., Detroit, Mich.
"American Machinist," September 28, 1922



The coupling is all-steel, has a machine cut spring and is made for shafts up to 1 in. in diameter. Its body is formed from a cylindrical tube and hollow-head safety screws secure it to the shafts. The device is intended for direct connecting light-duty motors to small drilling machines or other tools where shafts are slightly out of line and where it is desired that the coupling should reduce the friction in shaft bearings and act as a shock absorber on sudden starts. By bending in the spring, the coupling allows for both angular and parallel misalignments. A standard line of coil-spring flexible couplings for shafts from 1 to 12 in. in diameter is also furnished.

Marking Machine, Bench-Type, No. 13
Noble & Westbrook Manufacturing Co., Hartford, Conn.
"American Machinist," September 28, 1922

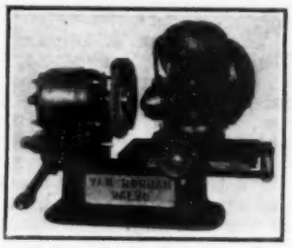


The machine is small, inexpensive and capable of marking four lines of $\frac{1}{16}$ in. lettering on flat or cylindrical articles up to 2 in. in diameter. The marking is done by means of cylindrical steel marking dies. On flat articles the die rolls over the work, and on cylindrical articles both the die and the work roll together. Pressure is applied from the top and not upward through the table as in the larger models. The table can be raised by a handwheel in steps of thousandths of an inch and locked in the proper position. It is furnished with one die holder of suitable design for either flat or cylindrical parts. Bench space, 10 x 12 in. Weight, 60 pounds.

Dresser, Wheel, for Vertical Surface Grinding Machine
Pratt & Whitney Co., 111 Broadway, New York, N. Y.
"American Machinist," September 28, 1922

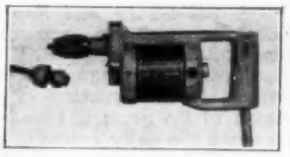
The device is for dressing wheels of vertical surface grinding machines without the danger of injury to the operator. It consists of a bracket bolted or riveted to the wheel guard and supporting the stem on which the dresser proper is pivoted. The dressing wheels are held in one end of a bent bar so that they come to position on the face of the wheel. The other end of the bar forms a handle so that the wheels can be easily moved into position. The dressing wheels can be moved on the face of the grinding wheel in the same manner as the hand dresser is employed. No change in the set-up of the work or wheel is necessary when the dressing is done.

Grinding Machine, Poppet Valve, Self-Contained, Small, "Valvo"
Van Norman Machine Tool Co., Springfield, Mass.
"American Machinist," September 28, 1922



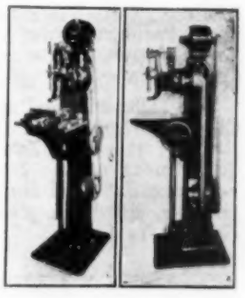
The machine is for grinding the poppet valves of automotive engines. The grinding wheel is mounted directly on the shaft of a ½-hp. motor, while the work head spindle is driven by gearing from a 1/20 hp. motor. The swiveled work head is carried on a movable slide operated by a handle at the left. The valve stem is held in a split draw-in collet which has a capacity up to $\frac{7}{16}$ in. in diameter. The valve is passed across the face of the wheel, while the work is fed to the abrasive wheel by the hand feed wheel at the right. The reamer for the valve seat can be ground at the same setting. Length, 20 in. Width, 15 in. Height, 16 in. Wheel size, 6 x ½ in. Weight, 110 pounds.

Drill, Electric, Portable
Titan Manufacturing Co., 140 So. Dearborn St., Chicago, Ill.
"American Machinist," September 28, 1922



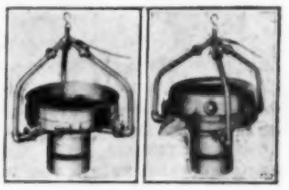
The drill is of the universal type and will operate on either a.c. or d.c. It runs at high speed on light loads and slows down on the heavier loads, providing the proper change in speed for different sizes of drills. The windings are coated with a special compound and baked 90 hours, resulting in a solid coil from which the wires cannot work loose. A vent is located in both the upper and lower branches of the handle, the air being discharged in front of the housing. A spring stop holds the armature from turning when opening or closing the chuck. The quick-break switch located in the handle of the drill can be operated by the thumb.

Drilling Machine, Laying Out, K-N
E. L. Krag & Co., 50 W. Randolph St., Chicago, Ill.
"American Machinist," September 28, 1922



The machine is intended for use in conjunction with the Johansson compound slide and blocks for locating holes. A rigid arm extends below the point of the drill so that a bushing of the correct size for the drill can be located just above the surface of the work. The table of the machine is adjustable for height. The spindle housing and the bracket holding the guide bushings are cast in one piece. Six speed changes are provided of from 400 to 4,300 r.p.m. As a routing or milling machine, the tool can be operated with a single-lip cutter. The head of the machine swings 360 deg. It may be removed from the column and mounted on a milling machine.

Sifter and Strainer, Portable, Electric-Driven
J. D. Wallace & Co., 1401 W. Jackson Blvd., Chicago, Ill.
"American Machinist," September 28, 1922



The device is for rapidly sifting and straining and can be hung from any convenient support. The extreme motion of the riddle is only $\frac{1}{16}$ in. from its central position. The motor is connected directly to the riddle. The armature and the shaft of the motor remain stationary and the field and housing revolve at high speed, giving an eccentric or circular vibrating motion to the riddle. A valve trap at the air intake keeps out the dust and dirt. An 18-in. riddle having a No. 2 screen is ordinarily supplied. The straining attachment at the right has considerable capacity both above and below the screen. The device requires very little head room.

Clip, paste on 3 x 5-in. cards and file as desired

vegetable and other oils. James W. Conway and Edward P. Thompson, of Atlanta, and Herman Bollmann, of Hamburg, Germany, are the incorporators.

The Abrasive Co., Philadelphia, Pa., manufacturer of grinding wheels and abrasive materials, is now operating at 90 per cent capacity, according to reports issued by the company.

The Warren & Irrgang Co., of 238 Dwight St., Springfield, Mass., has bought the factory building in Chicopee, formerly used by the S. Blaisdell, Jr., Co., at a price of $18,000, for the expansion of their production of factory trucks and tractor trailers, and will remove their operations there as soon as necessary alterations have been made in the building.

The Southern Metal Trades Association, headquarters of which are in Atlanta, has started publication of an official monthly organ under the name of The S. M. T. A. It is devoted to a discussion of southern industrial conditions largely, and is edited by William E. Dunn, Jr., secretary of the organization.

The Rabe Pipe and Foundry Co., of Chattanooga, Tenn., according to a recent announcement by R. R. Rabe, president of the company, is planning the immediate construction of a large addition to its present foundry that will increase the daily capacity to about 100 tons. The plant is at North St. Elmo, just outside Chattanooga.

The Facto Motor Trucks, Inc., Springfield, Mass., has taken out a building permit for a brick, steel and concrete building to cost $35,000, to meet the requirements of the company's new 2½-ton truck about to be put into production. The building is to be located at 296 Pecousic Boulevard, where the company already has a small building in which the experimental work has been done. Adolf A. Geisel is manager, and H. G. Farr, formerly chief engineer for the Knox Motors Co., is in charge of plant production.

The Independent Pneumatic Tool Co., Chicago, announces that Harry J. Reefe, formerly manager of the order department of the company, has just been appointed to the position of purchasing agent, in place of Thomas J. Keegan, resigned.

Personals

D. K. HUTCHCRAFT has been made district manager of the new branch of the Chicago Pneumatic Tool Co., at Tulsa, Okla.

E. G. BUCKWELL, secretary and sales manager of the Cleveland Twist Drill Co., and associated with that organization for the past twenty-three years, has retired from active work. He will, however, remain as a director of the company and retain his interests in it.

L. F. CARLTON, for eighteen years connected with the Consolidated Press Co., but during the past two years devoting his time to the field of farm and landscape equipment, has again become active in the press line. He has recently been appointed western sales manager of the V. & O. Press Co., of Brooklyn, N. Y.

R. H. WOOD, formerly Chicago manager of Modern Tool Co., has been appointed manager of the small tool department of the Consolidated Machine Tool Corporation, Detroit, Mich. The interests of that organization having been taken over recently by the Consolidated Machine Tool Corporation.

OTTO H. OLSON has been promoted to the position of general foreman of the Barber-Coleman Co., Rockford, Ill. Mr. Olson entered the employ of the company in 1905 as an apprentice and completed his course in 1908. Since that time he has held foremanship positions in many departments of the plant.

OGDEN R. ADAMS of Rochester, N. Y., who for the past eighteen months has been associated with the Seneca Falls Manufacturing Co., Inc., in the capacity of president and general manager, has severed his connection with that corporation, his resignation becoming effective as of Nov. 1, 1922. Mr. Adams will hereafter devote his entire time to his business interests in Rochester, Buffalo, and Syracuse.

A. H. HUNTER, president of the Atlas Steel Corporation, formed by the merger of the Atlas Crucible Steel Co., and the Electric Alloy Steel Co., has resigned.

W. NOCHUMSON, western representative of Clark Equipment Co. and Clark Tructractor Co., has moved his headquarters from 86 East Randolph to 30 North Clinton Street, Chicago, Ill.

Obituary

JOHN S. LESTER, 1185 Peachtree St., Atlanta, for the past twenty years southern representative of the Remington Arms and Ammunition Co., of New York, died recently in New York City, after an illness of about two weeks. Mr. Lester was 54 years of age.

GENERAL LUCIUS ALBERT BARBOUR, of Hartford, Conn., prominent in industrial circles of Connecticut, died at his home in Hartford, Monday, November 6, after a long illness. He was 76 years of age and at the time of his death was a director of Landers, Frary, and Clark Co., New Britain, Conn., and several other industrial organizations, and financial institutions.

HERBERT T. GRANTHAM, vice-president of the Belmont Iron Works, Philadelphia, died suddenly in that city, Nov. 5.

W. D. NORTON, for many years a prominent figure in Cincinnati business circles, died last week at Magnetic Springs, Ohio. For several years Mr. Norton and his brother, Clair H. Norton, conducted the business known as the Norton-Broadway Machinery Co., at 238 Broadway, New York City.

GEORGE T. MONTGOMERY, head of Montgomery and Co., Inc., dealers in tools and hardware supplies, 105 Fulton St., New York City, and a director in the Thompson Meter Co., Brooklyn, died at his home in New York City, November 7, at the age of 50. He was prominent in civic and club affairs. He leaves a wife, two daughters, a brother and three sisters.

Book Reviews

Export Merchandising. By Walter F. Wyman, Sales and Export Manager, the Carters' Ink Co. Four hundred and five pages, 6 x 9; 15 special inserts. Published by the McGraw-Hill Book Co., 370 Seventh Ave., New York City. Price $4.

Here is a really good business book on a subject of first importance. It comes at a time when America is adjusting her glass for a broader and more minute inspection of international commerce; when the real significance of overseas trade is beginning to dawn in American industry; at a period when the county is upon the threshold of an era which will be marked by keen conquest for markets abroad and in which only the fittest and best prepared will survive.

Here and there in America are found a few products which have become international household words. A cursory examination to discover the reason for this condition develops at the outset the fact that there has been within each organization a very broard, definite and thorough foreign trade policy. Of such is Carters' Ink and to the author of Export Merchandising, Mr. Walter F. Wyman, belongs to a very great extent the credit for its success. He speaks with authority and wide experience.

The book opens with a chapter on Common Sense in Exporting Trade. It is all that the title signifies. To those who have long been in the habit of looking upon export trade as a "great business venture," who have been hypnotized by the appearance of a foreign postage stamp in their morning mail, this chapter alone is well worth the price of the book. It is a refreshing, every-day view point and shows that, fundamentally, there is but little difference between foreign and domestic business.

In the second and third chapters the desirability of entering foreign markets is stressed as a measure of insurance against dull periods at home. The necessity for establishing, at the outset, a sound export policy is made clear with common sense reasons as to why and wherefore.

With these foundations laid, the author plunges into the important matter of organizing for overseas trade, discussing at length in his characteristic practical manner the export department, its functioning, where it should be located, its manager and his qualifications, and the method of securing and training export salesmen.

Chapters XI to XVI are given over to subjects which are of prime importance to every manufacturer who now is engaged in or who may be considering the question of placing his wares on shelves in other lands. The author prepares the field for the salesman and he prepares the salesman for the field. He shows how he cooperates with him and gives his method of developing the trade by correspondence as well as his advertising campaigns.

The last half of the book, Chapter, XVIII to XXXVI are discussions of the great questions of commission houses, exclusive agents and agency contracts, sales campaigns, credits and credit risks and methods of foreign collections.

The book, on the whole, represents the thought and study of a man who has been long identified with foreign trade and whose record is one of eminent success. Its pages are filled with numerous interesting and instructive facts and the entire subject of export mechandising is presented in a manner which does not make reading a burden.

Factory Accounts in Principle and Practice. By Garke and Fells. Two hundred and ninety, 6 x 9-in. pages. Published by D. Van Nostrand Co., 8 Warren St., New York, N. Y. Price $5.

The book is a handbook for accountants and manufacturers and contains, in addition to the ten-chapter discussion of systems of factory accounting, appendices, on the nomenclature of machine details and the rating of factories, a table for the amortization of leases, a glossary of terms and a large number of specimen rulings.

The foreword has been written by Mr. Fells and describes scientific methods in business administration and management. The introductory chapter relates the history of the development of the modern factory system and emphasizes the effect of

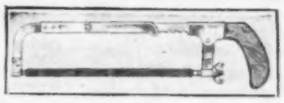
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Hacksaw Frame, "Easy Grip"

Consolidated Tool Works, Inc., 296 Broadway, New York, N. Y.

"American Machinist," September 28, 1922

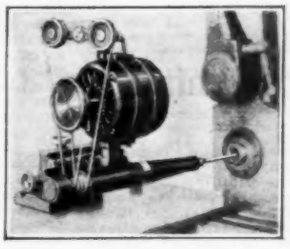


The handle of the frame is so positioned that it affords a comfortable grip for the operator, does not cramp his hand and enables him to obtain a powerful stroke. The frame is made entirely of nickel-plated steel with the exception of the wooden handle. The wing nut for tightening the blade is located at the rear or handle end of the tool, where it is out of the way. The blade may be turned to face in any of four directions.

Spindle and Housing Extension for Thread Grinder, "Precision"

Precision and Thread Grinder Manufacturing Co., Philadelphia, Pa.

"American Machinist," October 5, 1922



The attachment consists of an extension housing and an extension spindle and is applicable to deep internal grinding. The device has a number of uses and can be mounted on different types of machines. The extension housing is screwed directly on the threads at the front of the spindle cap of the grinder. The extension spindle couples on the end of the regular spindle by means of a tapered joint and is supported by double radial and end-thrust ball bearings at the extreme outer end of the housing. Capacity, 12-in. depth on holes 2 in. or larger in diameter; 6-in. depth on holes ½ in. in diameter.

Slide Rule, Circular, "Midget"

Gilson Slide Rule Co., Niles, Mich.

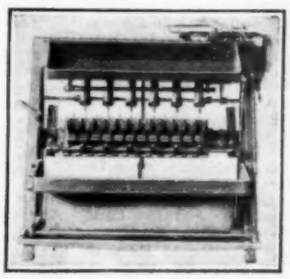
"American Machinist," October 5, 1922

The longer indicator of the rule gives the answer to the problem that is being solved. On the back, scales give the sines, tangents, cosines and cotangents of all angles from 0 to 360 deg., and the decimal equivalents of fractions to six places. The binary scale is divided into 64ths, 32nds and 16ths, and is concentric with another for adding and subtracting decimals and fractions. Concentric with these two scales are the thread and drill size scales. Drills from 60 to 1 and from A to Z are given in thousandths or in 64th of an inch. The drill size to use with any tap of V or U. S. S. thread from 3 to 50 per in. is given. Other scales give logs to the base *e* and the base 10, as well as the square roots and corresponding powers.

Threading Machine, Tilted, No. 3

Holmes Engineering Co., Oshkosh, Wis.

"American Machinist," October 12, 1922

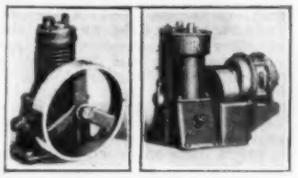


When equipped for tapping, the machine has both forward and reverse movements for the spindles. The six spindles are placed at an angle of 30 deg. from the vertical. Six of the twelve jigs employed are brought up simultaneously to the taps by a treadle while the six idle jigs are being loaded. A work shelf to accommodate two tote boxes full of parts is located just above the spindles. Capacity: internal threading, taps up to ¾-in. U. S. S. threads, 1-in. S. A. E. threads; external threading, up to 1 in. U. S. S. or 1¼ in. S. A. E. threads. Floor space, 66 x 41 in. Height, 65 inches.

Compressors, Air, Vertical, Small, Type 15

Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

"American Machinist," October 5, 1922

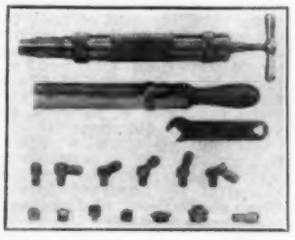


The machine is built in four sizes in either the plain belt-driven type shown at the left, or the self-contained electric-motor-driven outfit at the right. With the motor drive, the compressor may be driven by means of a pinion and internal gears, or by a short belt. It has a constant-level lubrication system, automatic constant-speed unloader in the belt-driven machine, and centrifugal unloader for controlling the starting and stopping. The smallest size may have either a ribbed, air-cooled cylinder for intermittent service or a water-jacketed cylinder of the reservoir type for constant service. All other sizes are built with the water jacket.

Lubricator, Bearing, Hand-Operated, High-Pressure, "Dot"

Carr Fastener Co., Boston 39, Mass.

"American Machinist," October 5, 1922



The device is for forcing oil or grease into bearings. Nipples with a spring-loaded ball in the top which automatically closes the opening, are applied to the bearing boxes and can be furnished to face at any angle. The lubricator is fitted with a plunger for ejecting the oil. The nozzle is an integral part of the device and has a special triangular shape to fit the nipples. A slight turn of the handle to the right locks the nozzle to the nipple. With further turning the valve opens and the lubricant is forced under high pressure into the nipple. A quarter turn to the left releases the nozzle and the valve automatically shuts off the lubricant.

Lubricator, Bearing, Ball-Feed, "Auto-Vac"

Kelly Lubricator Corporation, 107 N. Franklin St., Syracuse, N. Y.

"American Machinist," October 5, 1922

In this device a small ball fitted at the bottom of the sliding tube rests on the shaft to be lubricated. This ball is free to rotate in its tube, in which are small oil channels, and which is held in place against the shaft by means of a small spring. The oil adheres to the surface of the rotating ball and is carried to the bearing surfaces by the revolving shaft. Oil is fed only when the machine is in motion. The lubricator is made in four sizes having capacities of ¼, ½, 1 and 2 ounces.

Belt-Lacer, Vise-Operated

Detroit Belt Lacer Co., Detroit, Mich.

"American Machinist," October 12, 1922

The device is for applying wire belt lacing to belting without the use of the regular bench-type closing machine. It is held open by means of a spring so that it retains its position on the vise jaws. When the vise is closed, the jaws come to the proper position to shape the lacing. The device is made of steel, while the magazine is bronze. The standard staggered-type wire belt lacing is employed. The hooks mounted on cards are placed in the closing device and the belt held in position by hand. Pressure from the vise sinks the hooks into the belt and flattens the lacing. Rawhide pins connect the lacing on the two ends of the belt.

Clip, paste on 3 x 5-in. cards and file as desired

accurate accounting on employees. Chapter II deals with labor and under this heading takes up time recorders, wages, wages book, wages journal, traveling and other expenses, factory rules, and rent, and is followed by a diagram of the assimilation of wages and commercial books.

Chapter III discusses stores, covering the purchase of material for plant maintenance, purchasing records, stores accounts, estimates to precede expenditures, consumption of material, material returned to vendor, stores rejected book, cost of processes and qualities, byproducts. The chapter ends with a diagram of the assimilation of stores and commercial books.

Prime cost and the cost ledger are the subjects of Chapter IV. The distinction between stock and stores is brought out, and standard parts, the cost ledger, channels, expenditure, work in progress, actual and estimated costs discussed. This discussion is continued in Chapter V under the heading of indirect or incidental expenses and their allocation, followed by diagrams of the assimilation of cost and commercial books.

Fixed capital and depreciation in relation to capital, to current expenditure, to railway and water companies, to reserve funds, to obsolescence, to the life of the object and to the cost of maintenance, as well as the loss on capital, the loss on revenue accounts and the income tax acts, comprise Chapter VI.

Machinery use is the subject of Chapter VII and in this connection the expenditure on the plant, the ratio between the life and the cost of a machine, the idle hour rate, the productive hour rate, the normal machine rate, the cost of fuel, the valuation of patents and goodwill, wasting assets are covered. Chapter VIII deals with stock, its distribution and sales records followed by a diagram of the assimilation of stock and commercial books. Chapter IX gives the value of surveys, stocktaking, the valuation of old material, reduction in the valuation of stocks. The discussion of factory systems is concluded in Chapter X with a description of the subsidiary books essential to accurate factory accounting. The appendices and glossary previously mentioned complete the book.

American Malleable Cast Iron. By H. A. Schwartz. Three hundred eighty-four 6 x 9 in. pages, 190 illustrations. Cloth boards. Published by The Penton Publishing Co., Cleveland, Ohio.

A welcome addition to the literature of malleable cast iron, which, to quote the author, "is limited to a single book first issued about ten years ago and now out of print, and to a series of articles of great diversity of character and quality in the technical publications of this country and Europe."

Mr. Schwartz set himself the task of writing a book for both specialist and layman, and has very well accomplished his aim. He suggests that his book may serve a useful purpose as summarizing and recording the contemporary state of the art in the metallurgy of American malleable cast iron in theory and practice. There is much that is elementary, for which the average reader will be thankful. The specialist will find there is ample content aside from that which is elementary.

A selected bibliography forms an appendix. It is classified under four general headings: General Information, Production, Metallurgy and Metallography, Properties and Uses. Two other valuable features are a complete index and a list of illustrations. It is gratifying that the first two chapters tell of the early history of ironmaking and the development of the malleable industry in the United States.

The third to nineteenth (last) chapters treat of the metallurgy and malleable iron; general manufacturing and plant; melting stock; fuel and refractories; air furnace melting; electric furnace melting; cupola and open-hearth melting; annealing practice; principles of annealing; molding and pattern making; cleaning and finishing; inspecting and testing; tensile properties; compression, bending and shear; fatigue; impact, hardness and wear; plastic deformation; and thermal and electrical properties.

Belt Conveyors and Belt Elevators. By Frederic V. Hetzel. Three hundred twenty 6 x 9 in. pages, 291 illustrations, 58 tables. Cloth boards. Published by John Wiley & Sons, Inc., 432 Fourth Ave., New York, N. Y. Price $5.00.

Knowledge acquired during 30 years' experience at drafting board, in the shop, and in the field, is given by the author in this thorough treatise on belt conveyors and elevators. The book was written for men who have material to handle—consulting engineers, designers and students. The information is given an analytical presentation most acceptable to those groups, all of which must know the how and why of the methods and equipment they deal with.

The section devoted to belt conveyors begins with a general description of their component parts, follows with a brief history of the development of belt conveyors and then takes up the subjects of belts and their manufacture, how the belts are supported, guided, driven, locked, protected and cleansed, tension devices, discharging methods, conveyors.

Belt conveyors are the subject of the second part. Divisional subjects are centrifugal discharge elevators, elevator buckets, continuous bucket elevators, belts for elevators, fastening buckets to belts, driving belt elevators, elevator boots, inclined elevators, elevator casings.

Why Manufacturers Lose Money. By Robert Grimshaw. 176 pages, 5 x 7½ inches. Published by D. Van Nostrand Co., New York. Price $2.

As stated in the preface, this book is the outcome of a series of lectures on cost reduction delivered by the author in Germany and Austria in 1913 and 1914 and later lectures in this country.

The book is divided into sections dealing with the different causes of losses, such as financial, commercial, organization, technical, personal and miscellaneous. Each cause is taken up in considerable detail and many interesting incidents are given to bear out the points made. Machine equipment, supplies and their purchase, the personnel of workers and many other factors are shown in an interesting manner. There are few who cannot get valuable suggestions from the volume.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Internal combustion engines, machinery and articles suitable for dairymen and farmers—Australia. Purchase or agency desired. Quotations, c.i.f. southeastern Australia. Reference No. 4172.

Complete installation for a large sawmill and for the manufacture of boxes and shooks—Portugal. Purchase desired. Quotations, c.i.f. Portuguese port. Correspondence, French or Portuguese. Reference No. 4186.

Machine for making sisal twine of about 12 strands, and a machine for weaving sacks of sisal twine of various sizes up to 28 by 44 inches. Machine should have a capacity of 1,000 to 2,000 sacks per day of 8 hours—Mexico. Purchase desired. Quotations, f.o.b. New York or New Orleans. Reference No. 4196.

Small locomotives for narrow-gage railway, steam rollers, crushers and all necessary equipment and material for the construction of a harbor and dock—France. Purchase desired. Correspondence, French. Reference No. 4228.

All machinery connected with printing and stereotypography—Switzerland. Purchase desired. Quotations, f.o.b. New York. Reference No. 4230.

Pamphlets Received

Labor and Industrial Conditions in China. Trade Information Bulletin No. 75, by Julean Arnold and William H. Gale of the Department of Commerce. Published by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

Algeria. Trade and Economic Review for 1921, No. 19, on the state of trade in Algeria. Published by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

Haiti. Trade and Economic Review for 1921, No. 17, on the state of trade in Haiti. Published by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

Venezuela. Trade and Economic Review for 1921, No. 18, on the state of trade in Venezuela. Published by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

Employers Liability Laws. A compilation of laws relating to mediation, conciliation, and arbitration between employers and employees; laws, disputes between carriers and employers and subordinate officials under the Labor Board, eight-hour laws, etc. Compiled and issued by The House Document Room, House of Representatives, Carl G. Mamberg, Superintendent, Washington, D. C.

Trade Catalogs

Flexible Shaft Driven Tools. The S. S. White Dental Manufacturing Co., Philadelphia, Pa. This company has just published a new catalog of 36 pages, illustrating and describing the numerous styles of flexible shaft driven tools of its manufacture and pointing out their many uses in industrial fields, such as drilling, grinding, polishing, engraving, die sinking, reaming, chasing, sharpening, tool room work, etc.

Midwest Steel Sections. The Midwest Steel and Supply Co., 28 West 44th St., New York City. This company has just published a fifty-four page Architect's and Engineer's Data Book covering Midwest steel sections for overhead shafting layouts and anchorage of piping, cables, machinery, monorails, car tracks and other equipment. The publication has been prepared with care and is replete with illustrations and line drawings of characteristic installations.

Bullard Mult-Au-Matic Operator's Handbook. The Bullard Machine Tool Co., Bridgeport, Conn. This company has just issued a 93-page handbook for operators of the Bullard Mult-Au-Matic machines which is of exceptional value not only to present users of this type of equipment, but to all companies seeking quantity production at low cost. The handbook discusses in detail the construction features of the machine, its operation and care, methods of setting up, speed and feed data, standard tool equipment, and contains a great many diagrams, line drawings, charts and other valuable data related thereto. Every effort has been made to make the instructions complete and cover every function of the machine. The diction and diagrams are marked by simplicity and clearness.

Forthcoming Meetings

Automotive Equipment Association. Annual show and meeting, November 13 to 18, Chicago, Ill.

National Founders' Association, Fall meeting, Hotel Astor, New York City, Nov. 22 and 23. Secretary, J. M. Taylor, 29 South LaSalle St., Chicago, Ill.

Eighteenth Annual Automobile Salon, Commodore Hotel, New York City, December 3 to 9, 1922.

American Society of Mechanical Engineers, annual convention, December 4 to 7, 1922, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Exposition of Power and Mechanical Engineering. Dec. 7 to 13, 1922, Grand Central Palace, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Automobile Chamber of Commerce, National Automobile Show, Grand Central Palace, New York City, January 6 to 13, 1923.

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

American Engineering Council, Annual Meeting, January 11 and 12, at the headquarters of F. A. E. S., 24 Jackson Place, Washington, D. C. L. W. Wallace, Secretary.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16. Engineering Societies Bldg., New York. F. L. Hutchinson, Secretary.

American Institute of Mining and Metallurgical Engineers, Annual Meeting, February 19 to 21. Engineering Societies Bldg., New York. F. S. Shartless, Secretary.

American Foundrymen's Association, Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Society for Testing Materials, Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philidelphia, is secretary.

New and Enlarged Shops

Machine Tools Wanted

Ala., Anniston—Kilby Pipe Co., (manufacturer of cast iron pipe, fittings, etc.), E. M. Kilby, Pres.—foundry and machine shop equipment.

Fla., Odessa — Dowling Bros. — power house, machine shop and lumber mill equipment.

Ga., Rome—Battey Mchy. Co., West 2nd Ave., J. Cunningham, Secy. and Treas.—gear cutter, similar to No. 13, Brown & Sharpe.

Mass., Ashland — Lombard Governor Co. (manufacturer of governors, etc.)—boring mill and tool room lathe (used).

Mass., Jamaica Plain (Boston P. O.)—W. F. Somes, 38 Green St. (machine shop)—one 15 ft. x 8 ft. to 0 in. screw cutting lathe, also small bench grinder (used).

Mo., Valley Park—Barbour Boat Co.—reversible shaper.

N. Y., Buffalo—F. L. Bumpus, Jr., 1431 Seneca St.—machinery, tools and equipment for gasoline and automobile service station at 1437 Seneca St.

N. Y., Buffalo—C. B. Druar, 233 Dearborn St.—auto repair tools for garage at 282 Franklin St.

N. Y., Buffalo—S. Jacobson, 1168 Abbott Rd.—equipment for automobile repair shop and service station on Abbott Rd. and Bailey Ave.

N. Y., Buffalo—McKaig & Hatch, Ontario and Skillen Sts.—20 or 24 in. production drill press, either 1 or 2 spindles.

N. Y., Buffalo—P. C. Schasre, 128 Arkansas St.—equipment for mechanical automobile repair shop.

N. Y., Naples—E. D. Cornish & Son—machinery, tools and equipment for garage and service station on Main St.

N. Y., Newburgh—J. F. Pittishnock, 66 Bridge St. (jewelry repairing) — power lathe, counter shaft and chucks.

N. Y., New York—A. Loewy, 200 5th Ave.—4 die presses.

N. Y., New York—Logan Constr. Co., 15 Park Row—portable Toledo pipe threading machine.

O., Columbus—Stitt Ignition Co., 16 East First Ave., (manufacturer of spark plugs) B. F. Stitt, Vice. Pres.—automatic screw machine to increase capacity.

Okla., Enid—Kingham Machine Shop, A. Kingham, Purch. Agt.—engine lathe with 14 to 16 ft. bed, also milling machine, belting, shafting, pulleys and hangers.

Pa., Nanticoke — The Nanticoke Garage Co.—machinery and equipment for proposed $65,000 garage on Spring St.

Pa., Pittsburgh — Atlantic Refining Co., Chamber of Commerce Bldg.—mechanical machinery and equipment for large gasoline and service station on Franklin and Main Sts., Titusville.

Pa., Pittsburgh—Atlantic Refining Co., Chamber of Commerce Bldg.—machinery, tools and equipment for proposed large gasoline and service station on Pennsylvania Ave. and Water St., Warren.

Pa., Pittsburgh—Neely Nut & Bolt Co., 26 South 22nd St.—lathe, shaper, grinder, miller, hacksaw, drill press and arbor press.

Pa., Pittsburgh—The Pennsylvania R.R., Pennsylvania Sta., W. G. Phelps, Purch. Agt.—list of machine tools for Columbus, O., shops.

Wis., Baraboo—Allan-Diffenbaugh Wrench & Tool Co., L. A. Maisel, Mgr.—machinery and equipment for the manufacture of wrenches, tools, etc., also power machinery.

Wis., Kiel — A. B. Bessler — drill press, lathe, emery wheel and air compressor for garage.

Wis., Milwaukee—Bahde Mfg. Co., 2621 Vine St., (manufacturer of patented mechanical articles), C. A. H. Bahde, Purch. Agt.—speed drills and emery wheels.

Wis., Milwaukee—Sun Light Aluminum Co., 280 East Water St.—29 in. power paper cutting machine and bench shears.

Wis., Racine—Heeter & Heeter, Inc., 1309 Rapids Drive, R. Heeter, Purch. Agt.—repair machinery for garage, including drill press and air tank.

Ont., Toronto—The Toronto Motor Car Ltd., 52 James St.—equipment for proposed $100,000 garage on Jarvis St.

Machinery Wanted

Calif., San Francisco—The Banner Refining Co., Kohl Bldg.—machinery for proposed refinery on Islais Creek.

Calif., San Francisco — The city and county of San Francisco, M. M. O'Shaughnessy, Engr., City Hall—receiving bids until Dec. 6 for one 4 motor electric traveling crane, 8 wheel type with maximum working load of main hoist 270,000 lbs., and auxiliary hoist 30,000 lbs. Approximate maximum speeds of operation with full working loads shall be as follows: main hoist 4 to 5 ft. per minute, auxiliary hoist 25 to 28 ft. per minute and trolley and bridge travel 60 to 80 ft. per minute.

Conn., Seymour—Seymour Mfg. Co. (copper and silver goods)—10 iron body mill trucks, length 10 to 12 ft.

Conn., Waterbury — Hamilton Bottling Wks., Burton St.—equipment for proposed bottling plant.

Fla., Apalachicola—W. L. Papham—electric refrigeration machinery.

Idaho, Nampa — Job Printer, 202 Colonial St.—complete newspaper equipment, including press, linotype, paper cutter, belting and hangers.

Ill., Chicago—Bunge Bros. Coal Co., 1648 West Lake St.—one coal crusher.

Ill., Chicago—Jointless Fire Brick Co., 1130 Clay St. — machinery for proposed brick manufacturing plant at Trenton, N. J.

Ill., Chicago—Print Shop, 1212 Addison St.—22 x 25 in. pony press.

Ill., Chicago—The Western Feed Manufacturers, 345 North Elizabeth St.—portable mechanical conveyors and pilers; automatic scales; feeders, motor power for feed mill at Rice Lake, Wis.

Ill., Morrison — Shawyer Printing Co. — galley proof press and type cabinets.

Ill., National Stock Yards—Natl. Publishing Co.—saw trimmer for power equipment.

Ind., Kokomo—E. Hersenberger, Box 602—printing press, power equipment, also hand wire stapler.

Ia., Iowa City—State University of Iowa, A. V. O'Brien Supt. of Shops—small size electric furnace, resistance type; recording pyrometer; 1,000 lb. steam hammer; Arc welding equipment; one 18 to 20 in. pattern makers' lathe, with slide rest; one 16 to 18 in. disc sander; one Universal wood workers' vise; also two 14 in. x 5 ft. engine lathes.

Kan., Wichita—H. S. Hoeffien, 1516 North Waco Ave. (woodworker)—110 volt, 2 hp. motor, belting, rip saw, shafting, hangers and pulleys.

Ky., Lexington—Lexington Battery Mfg. Co., 416 West Short St.—machinery and equipment for proposed $75,000 plant, to replace that which was destroyed by fire.

La., New Orleans—R. C. Ostendorf, 1539 Canal St. (automobile repairing and paint shop)—welding outfit, paint removing machine and a small size electric drill (new or used).

La., Sterlington (Ouachita P. O.)—Imperial Oil & Gasoline Products Co.—machinery and equipment.

La., Sterlington (Ouachita P. O.)—Thermatomic Carbon Co., (manufacturer of carbon black and by products)—machinery and equipment for proposed addition to plant.

La., Windsor (Doss P. O.)—Texas-Louisiana Producing & Carbon Co.—machinery and equipment for plant for the manufacture of carbon black and similar products.

Me., South Sanford (Sanford P. O.)—Jagger Bros.—equipment for addition to spinning mill.

Md., Baltimore—D. C. Elphinstone, 408 Continental Bldg. (machinery)—crane, 75 ft. beam, electrically operated, capable of handling 2 yd. clamshell on 60 ft. radius; shovel, electrically operated, 3 yd. dipper, caterpillar or traction tread.

Md., Baltimore—Holtite Mfg. Co., Warner and Ostend Sts., (manufacturer of rubber heels, etc.), A. A. Esterson, Secy. and Treas.—40 in. mills.

Mass., Boston—Handschumacher & Co., 25 John St., (meat packers and wholesalers)—packing and cold storage machinery and equipment for proposed plant at 16 North St.

Mass., Boston—Knox & Morse Co., Inc., 140 Oliver St. (manufacturer of chemicals)—chemical manufacturing machinery of various kinds.

Mass., Boston—J. C. Santis, 149 Cummings St.—one automatic weighing machine and several 1 to 3 lb. packaging machines (used).

Mass., Millbury—S. E. Hull Co. (woolen mill, shoddy, etc.)—machinery for shoddy mill.

Mass., North Chelmsford—Lowell Textile Co., J. Reed, owner—woolen mill machinery.

Mass., Pittsfield — Clarknit Mills, Inc., (knitting mill), J. A. Clark, Treas.—machinery for mill.

Mich., Detroit—Chevrolet Motor Co., General Motors Bldg.—miscellaneous machine equipment for general automobile finishing, for proposed factory at Norwood, O.

Mo., Kansas City—The Lion Oil & Refining Co., 622 Finance Bldg., V. H. Smith, Secy.—10 or 12 complete Burton type oil stills, also a considerable amount of tankage.

N. H., Tilton—A. S. Brown Mfg. Co.—hosiery dyeing machine.

N. H., Tilton—E. W. Charland—textile machinery for small cotton and woolen goods manufacturing plant, including power cutting, sewing and stitching machines, etc.

N. J., Trenton—Castanea Dairy Co., 234 North Broad St.—machinery for proposed plant.

N. J., Trenton—F. A. Straus & Co., Johnson Ave. (manufacturer of worsted and silk yarns), W. Foster, 369 West State St., Gen. Mgr.—$150,000 worth of machinery for plant recently purchased.

N. Y., Alfred—C. D. Reynolds Co.—refrigeration and cold storage machinery and equipment to replace that which was recently destroyed by fire.

N. Y., Batavia—Gray Machine & Parts Corp. (manufacturer of wrenches)—machinery and equipment for large addition.

N. Y., Brockport—E. H. Norton and others—machinery for addition to plant for the manufacture of power spraying equipment.

N. Y., Buffalo—The Standard Milling Co., c/o A. E. Baxter, Engr., Ellicott Sq.—machinery and equipment for proposed flour mill, 30,000 bbl. daily capacity, on Outer Harbor.

N. Y., Buffalo — J. A. Walter Milling Co., Chamber of Commerce Bldg.—machinery and equipment for flour mill on Ohio St. and Erie Basin.

N. Y., Franklinville—Ontario Knife Co.—equipment for proposed addition to knife factory.

N. Y., Geneva—A. E. Meyers, 150 Castle St.—one crane and clamshell outfit, and one portable sand digger and loader.

N. Y., New York—McGowan & Connolly Co., 739 East 151st St., (marble)—lathe for turning stone column, 10 ft. long and 2 ft. diameter.

N. Y., New York—Natl. Biscuit Co., 85 9th Ave.—repair equipment for new shop on West 16th St.

N. Y., Rochester — Rapps Dry Cleaning Co., 398 South Ave.—complete mechanical equipment for $4,000 cleaning plant.

N. Y., Tonawanda—American Kardex Co., Main St. (manufacturer of Kardex filing system and equipment for offices)—machinery and equipment for proposed 2 story addition to factory on Main and Wheeler Sts.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Lead quoted in New York at 7½c. as against 7⅜c.; zinc, 7¾c. as compared with 7⅝c. per lb., last week. Prices higher in St. Louis. Improvement shown in copper inquiries. Advance of ¼c. in zinc sheets in New York and in brass rods in Cleveland; solder up 1c. per lb. in both cities. Cleveland warehouses also advanced babbitt metal 2c. and scrap lead ¼c. per lb., during week. Linseed oil market trifle softer; but Chicago advances price 1c. per gal. Buying better in lubricants; prices firm. Demand steadier for lard oil; New York quotes 60c. as against 55c. per gal. Discounts reduced about 10 points on leather belting.

Declines—Maximum on blue annealed steel sheets down 10c.; black and galvanized, 25c. per 100 lb., f.o.b. Pittsburgh. Mill price of shapes, plates and bars firm at $2 per 100 lb. on ordinary tonnages; shading of $1@$2 per ton on large inquiries. Some of the more attractive tonnages on shapes, have been taken at $1.90, but special or undesirable plate business, quoted as high as $2.10@$2.15 per 100 lb. Electrolytic and scrap copper both down ¼c. per lb. in New York warehouses. Connellsville coke reduced 50c. per ton; improvement in car supply.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	33.27
Southern Ohio No. 2	33.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	35.80
BIRMINGHAM	
No. 2 Foundry	27.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	32.64
Virginia No. 2	37.17
Basic	31.75
Grey Forge	30.50
CHICAGO	
No. 2 Foundry local	32.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	33.50
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	31.77
Basic	31.77
Bessemer	33.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
New York	5.5
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50@2.75	4.19	3.70	4.00
No. 12	2.60@2.85	4.24	3.75	4.05
No. 14	2.70@2.90	4.29	3.80	4.10
No. 16	2.90@3.20	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20@3.35	4.70	4.20	4.70
Nos. 22 and 24.	3.25@3.40	4.75	4.25	4.70
Nos. 25 and 26.	3.30@3.45	4.80	4.30	4.75
No. 28	3.35@3.50	4.90	4.40	4.85
Galvanized				
Nos. 10 and 11.	3.35@3.60	4.90	4.40	4.85
Nos. 12 and 14.	3.45@3.70	5.00	4.50	4.95
Nos. 17 and 21.	3.75@4.00	5.30	4.80	....
Nos. 22 and 24.	3.90@4.15	5.45	4.95	5.40
No. 26	4.05@4.30	5.60	5.10	5.55
No. 28	4.35@4.60	5.90	5.40	5.95

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	66	54½	⅜ to 1½	34	19
LAP WELD					
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	64	53½	⅜ to 1½	34	20
2 to 3	65	54½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 6%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
5/32	8.00		12@13
⅛	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.25
Tin, 5-ton lots, New York			38.00
Lead (up to carlots), St. Louis 6.80@6.85; New York			7.50
Zinc (up to carlots), St. Louis 7.20; New York			7.75
Aluminum, 98 to 99% ingots, 1-15 ton lots	New York 20.70	Cleveland 23.00	Chicago 20.00
Antimony (Chinese), ton spot	7.25@7.37½	8.50	8.00
Copper sheets, base	21.50	22.00	23.00
Copper wire (carlots)	16.00	18.00	16.25
Copper bars (ton lots)	20.00	23.00	19.50
Copper tubing (100-lb. lots)	24.75	25.00	23.00
Brass sheets (100-lb. lots)	18.50	20.75	18.75
Brass tubing (100-lb. lots)	23.00	24.00	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	19.00	15.75
Brass wire (carlots)	19.00	20.75	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ½), (caselots)	27.50	24.50	20.00
Babbitt metal (83% tin)	35.00	47.00	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.50	12.00
Copper, heavy, and wire	11.75	12.00	11.50
Copper, light, and bottoms	9.75	10.00	10.50
Lead, heavy	4.75	5.50	4.75
Lead, tea	4.25	4.50	4.00
Brass, heavy	7.00	6.50	9.25
Brass, light	6.00	5.75	6.00
No. 1 yellow brass turnings	6.50	7.00	7.00
Zinc	3 00	4.00	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11¼
Cotton waste, mixed, per b.	.065@.10	.09	.08
Wiping cloths, 13¼x13¼, per lb.	.16	32.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.93	1.01	.95
White lead, dry or in oil	100 lb. kegs.	New York,	13.25
Red lead, dry	100 lb. kegs.	New York,	13.25
Red lead, in oil	100 lb. kegs.	New York,	14.75
Fire clay, per 100 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$8.00	
Coke, prompt foundry, Connellsville	per net ton	10.00@12.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	40%	50-10-5%	50%
1½ and 1¼x3 in. up to 12 in	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in	30%	40-10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1⅛ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.60	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	65-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

N. C., Concord—Locke Cotton Mills Co. (cotton mills)—several "Crompton & Knowles" looms, 30 in. 2-box style.

N. C., Stanley—Lola Gingham Mills, Inc. —machinery and equipment for proposed $250,000 mill for the manufacture of ginghams and cloth.

O., Akron—General Tire & Rubber Co.—additional machinery and equipment for proposed 3 unit plant.

O., Alliance—Amer. Steel Fdry. Co.—4,000 lb. steam forging hammer.

O., Canfield — Dispatch, (newspaper) — model No. 1 linotype (new or used).

O., Cleveland—Denby Wire & Iron Co., 5119 Euclid Ave. (manufacturer of wire railings, bank fixtures, etc.)—additional machinery and equipment for new 1 story plant at 3005 East 86th St.

O., Cleveland—H. M. Warner, Engr., Public Auditorium, Lakeside and East 6th Sts. —one floor sanding machine.

O., Cleveland—H. P. Whitworth, Archt., 526 Hickox Bldg.—one chain belt conveying machine.

O., Columbus—Arrow Sand Co., Hartman Bldg., S. Stephanian, Purch. Agt.—conveying machine for overhead storage on Grandview Rd.

O., Columbus — Col-O-Hi Battery Co., Dublin Ave., J. D. Saley, Purch. Agt.—wood and metal working machinery.

O., Columbus—Columbus Varnish Co., 264 Cozzens St., W. S. Hanna, Pres.—varnish making machinery (new), canning and labeling machinery for proposed addition to factory.

O., Columbus—Rainbow Tire & Rubber Co., 402 Southern Hotel, C. E. Ross, Pres.—mills, presses, curing machines for plant at Delaware.

O., Delaware—The Sunray Stove Co.—machinery and equipment for proposed addition to factory.

O., Fremont—Stull-Boylston Co. (manufacturer of pens and pencils)—machinery and equipment for proposed plant at Lima.

O., Leetonia—Fabricated Steel Products Co.—cupola fan, 30 or 36 in., belt driven (used preferred).

O., Middletown—The Journal—Mergenthaler linotype and other printing equipment.

O., Newark—Tucker Boiler Works Co.,—machinery for the manufacture of steel tanks, also welding equipment.

O., Somerset—Belden Brick Co., G. Brand, Supt.—machinery and equipment for additions to brick manufacturing plant.

Okla., Oklahoma City—The New State Ice Co., 2 West 3rd St.—ice making machinery for new addition.

Okla., Stamps—Blackfoot Lumber Co.—machinery and equipment for proposed planing mill, to replace that which was destroyed by fire.

Ore., Portland—F. L. Evans, 412 Consolidated Security Bldg., (Industrial Engineer)—one to six 10 ton units for converting sawdust and wood waste into cattle feed, also to save the by products.

Ore., Portland—F. E. VanRank, 3212 68th St., S. E.—one universal woodworker with either band or scroll saw, lathe, shaper and planer, electrically driven.

Pa., Apollo—Apollo Steel Co., A. McCarthy, Purch. Agt.—two 15 ton cranes.

Pa., Catasauqua — Bryden Horse Shoe Co. (manufacturer of horse shoe calks)—machinery and equipment for new plant.

Pa., Coatesville—Lukens Steel Co.—machinery and equipment for 4 unit plant and warehouse at New Orleans, La.

Pa., Corry—The Corry Radiator Corp. —machinery and equipment for proposed foundry.

Pa., Irvine—National Forge & Tool Co.—forge and tool shop equipment.

Pa., Monessen—The Monessen Fdry. & Machine Co.—equipment for foundry to replace that which was destroyed by fire

Pa., Phila.—Arata Dye Wks., Front and Lombard Sts., J. B. Arata, Purch. Agt.—vats, dryers and other machinery for new dyeing plant.

Pa., Phila.—Breyer Ice Cream Co., 9th and Cumberland Sts.—ice manufacturing machines, mixers, cookers, wrapping and packing machines, conveyors, etc., for new plant.

Pa., Phila.—Elmwood Mills Co., 48 South Front St.—3 or 4 cylinder Garnett machines, 30 x 60 in.

Pa., Phila.—General Paper Products, 3430 Lancaster Ave., (manufacturer of paper and tin containers), G. L. Harnley, Purch. Agt.—creasing machines, dies and general metal and paper working machines.

Pa., Phila.—R. T. Moorehouse Paper Co., Bridge and Thompson Sts.—one power rotary coal and gravel screening plant.

Pa., Phila.—Mountain Valley Bottling Co., 1625 Water St., (manufacturer of beverages), R. R. Hogan, Purch. Agt.—automatic bottle washing and filling machinery.

Pa., Phila. — Winer Bakery, 60th and Osage Ave., J. Winer, Purch. Agt.—dough mixers, trays and furnaces for bakery.

Pa., Pittsburgh—Guibert Steel Co., Diamond Natl. Bank Bldg.—crane for new plant.

Pa., Pittsburgh—Mackintosh, Hemphill & Co., Engrs., foot of 12th St., A. Garrison, Fdry. Dept., Purch. Agt.—crane.

Pa., Wilkes-Barre — Diamond Drug Co., 116 East Northampton St., B. Miller, Dir. and Mgr.—machinery and equipment for the manufacture of a complete line of drugs, etc.

Pa., Williamsport—D. Updegraff & Co., Canal and Market Sts. — machinery and equipment for addition to monument works.

Pa., Windgap—A. F. Teel (slate mill)—grinding, cutting and finishing machinery.

Tex., Dallas—Print Shop, 2326 Live Oak St.—Chandler & Price power job printing press (used).

Tex., Fort Worth—The Printer, Box 845, —12 x 17 in. job press, paper cutter, wire stitcher, shafting, motor belting, hangers and pulleys.

Tex., Paris—The News, —job press, belting, hangers, shafting, pulleys and linotype.

Tex., Temple—J. J. Palmer—woodworking machinery, saws, belting, pulleys, hangers, bearings, shafting and sander.

Vt., Northfield — The Nautanna Worsted Co., Inc. (manufacturer of textiles)—equipment for carding room.

Va., Lynchburg — Lynchburg Fdry. Co., Peoples Natl. Bank Bldg.—pattern shop equipment.

Va., Richmond—The Wheeling Corrugating Co., 801 McDonough St.—machinery for proposed addition to factory for the manufacture of corrugated products.

W. Va., Clarksburg — Tygarts Valley Fuel Co., E. M. Prendergast, Dir.—machinery and equipment for extensive development of coal properties.

W. Va., Greenview—Greenview Coal Co., E. G. Watkins, Pres. and Mgr.—hoisting machinery and mining equipment.

W. Va., Parkersburg—Ideal Corrugated Box Co., Jeannette St.—corrugating machine.

Wis., Appleton — Kaukauna Quarry Co., c/o J. P. Frank, 803 College Ave—crushing machinery.

Wis., Chilton — A. A. Berger — sausage making, grinding and power machinery.

Wis., Crandon—The Vulcan Last Co.—power machinery for proposed shoe factory.

Wis., Fond du Lac—Combination Door & Screen Co., 180 Ruggles St.—woodworking machinery for proposed factory on Military St.

Wis., Green Bay—The Bond Pickle Co., Platten Bldg.—machinery for packing plant at Oconto.

Wis., La Crosse—Cameron Motor Car Co., 127 South 6th St.—gasoline storage tank with pump for proposed garage.

Wis., Madison—Capital Plating & Machine Co., 639 West Wilson St.—machinery and equipment for the manufacture of windshield spot lights, etc.

Wis., Madison — Madison Pattern Wks. Co., 2015 Winnebago St., W. J. Polk, Purch. Agt.—equipment for new pattern shop.

Wis., Manitowoc—Invincible Metal Furniture Co.—nickel plating machinery for the manufacture of vaults, safety deposit boxes, etc.

Wis., Menomonie—E. V. Johnson—repair machinery, gasoline storage tank, pump and air tank for garage to replace that which was destroyed by fire.

Wis., Milwaukee—J. J. Eckert, 701 56th St. (carpentry and millwork) — Universal woodworker.

Wis., Milwaukee—Federal Rug Cleaning Co., 914 Winnebago St.—cleaning equipment for proposed addition to factory.

Wis., Milwaukee—W. D. Mann, 204 Grand Ave. (machinist)—woodworking machinery (used).

Wis., Milwaukee—Wenzel & Henock Co., 498 27th St. (heating and plumbing)—unloading crane and belt driven air compressor.

Wis., Mosinee—The Mosinee Times, L. E. Osborne, Mgr.—machinery and equipment for addition to print shop.

Wis., Oshkosh—H. Thew. 52 State St. (woodwork)—band saw.

Wis., Rhinelander—S. Miller Cold Storage Co.—refrigerating and power machinery.

Wis., Rhinelander—The Northern Grain Co., O. C. Nelson, Mgr. — grinding and power machinery for proposed feed mill.

Wis., Rice Lake—Craftsman Job Printing Co.,—Gordon job printing press 14 x 22 in. for power equipment (used).

Wis., Stevens Point—The F. & G. Auto Parts Co., 425 Madison St.—air compressor, gasoline storage tank and pump for proposed $40,000 addition to garage.

Wis., Superior—Twin Ports Oil Co., J. E. Vgreziline, Mgr., — oil storage tanks and pumps for proposed filling station.

Wis., Suring—A. A. Baatz—equipment for new addition to blacksmith shop.

B. C., Vancouver—The False Creek Lumber Co., 6th Ave., W.—saw mill machinery for proposed mill.

Ont., Aylmer—J. L. Thayer & Son—complete equipment for proposed $40,000 garage and automobile repair shop.

Ont., Camperdown — Canada Oil & Gas Co., Ltd.—equipment for drilling.

Ont., Chatham—R. Baxter—equipment for saw mill, to replace that which was destroyed by fire.

Ont., Elmira—The Elmira Co-operative Creamery—equipment for proposed addition to creamery.

Ont., Toronto—Toronto Electric Comrs., Yonge and Shuter Sts.—receiving bids until Nov. 23 for overhead cranes.

Metal Working Shops

Calif., Emeryville — The Great Western Meter Co., 5701 South San Pablo Ave., Piedmont, awarded the contract for the construction of a 1 and 2 story factory, here. Estimated cost $26,850. Noted Nov. 9.

Calif., Oakland—J. E. French Co., 124 Grand Ave., awarded the contract for the construction of a 1 story automobile sales room and service garage on S. E. Bway. and Moss Ave. Estimated cost $65,000.

Calif., Oakland—N. S. Sacks, c/o H. J. Christensen, Contr., Federal Bldg., awarded the contract for the construction of a 1 story automobile school shop on 12th St. near Jackson St. Estimated cost $17,000.

Calif., Oakland—The United States Light & Heat Corp., 5432 East 14th St. is having plans prepared for the construction of the first unit of its manufacturing plant, 1 story, 134 x 160 ft., on 98th Ave. Estimated cost $50,000. Architect not announced.

Calif., Sacramento—The Latourette-Fical Co., 307 Front St., plumbing and heating contractors, awarded the contract for the construction of a shop building. Estimated cost $17,272. Noted Nov. 9.

Calif., San Francisco—L. R. Lurie, Mills Bldg., is having plans prepared for the construction of a 2 story, 62 x 137 ft. garage on Sacramento St. near Polk St. Estimated cost $54,000. A. S. Bugbee, 26 Montgomery St., Archt.

Calif., San Francisco—A. E. Perley, 240 Duboce Ave., awarded the contract for the construction of a 1 story, 60 x 75 ft. garage on 14th St. near Mission St. Estimated cost $75,000.

Conn., Fairfield—S. Lowe & Sons Co., 30 Sunfield Ave., is receiving bids for the construction of a 2 story, 45 x 80 ft. addition to its hardware factory. Estimated cost $25,000.

Conn., Rockyhill—The Connecticut Fdry. Co. awarded the contract for the construction of a 2 story, 30 x 70 ft. addition to its plant. Estimated cost $25,000.

Conn., Shelton—The International Silver Co., 48 State St., Meriden, awarded the contract for the construction of a 1 story, 30 x 40 ft. addition to its plant on River St., here. Estimated cost $25,000.

D. C. Washington—The Evening Star Newspaper Co., 11th St. and Pennsylvania Ave., awarded the contract for the construction of a 5 story paper warehouse and garage, to contain 12,000 sq. ft. of floor space, on Canal St. near 2nd St.

Ill., Chicago—T. R. Bishop, Archt., 35 South Dearborn St., is receiving bids for the construction of a 1 story, 100 x 220 ft. addition to garage for Reba Bros., 4728 Bway. Estimated cost $60,000.

Kan., Winfield—Stuber Bros. are having plans prepared for the construction of a 1 story, 100 x 140 ft. Ford service and sales station. Estimated cost $50,000. L. Schmidt & Co., 121 North Market St., Wichita, Archts.

Mass., Holyoke—The Bd. Pub. Wks., City Hall, plans to build a 1 story garage and service station. Estimated cost $80,000.

Mass., Peabody—D. Bertholdi, c/o G. A. Cornet, Archt., 10 Central Ave., Lynn, is having plans prepared for the construction of a 1 story, 45 x 130 ft. machine shop on Wilson Sq., here. Estimated cost $25,000.

Mass., Springfield — The Facto Motor Trucks, Inc., 296 Pecousic Ave., will build a 2 story, 80 x 105 ft. factory. Estimated cost $35,000.

Mass., Springfield — The Spartan Saw Wks., 41 Taylor St., awarded the contract for the construction of a 1 story, 42 x 100 ft. saw factory on Fisk Ave. Estimated cost $20,000.

Mass., West Springfield—The New England Smelting Wks., Union St., plans to build a 1 story factory. Cost between $15,000 and $25,000.

Mass., Worcester—The Parker Wire Goods Co., 18 Grafton St., plans to build a 1 story addition to its wire goods plant, to contain 30,000 sq. ft. of floor space, on Washington St. Estimated cost $75,000. Architect to be announced later.

Mich., Hancock—The Bd. Educ. will receive bids about Dec. 1 for the construction of a 3 story, 80 x 336 ft. school building, including forge, foundry, sheet metal and woodworking departments and automobile mechanics' shop. Estimated cost $300,000. G. L. Lockhart, 1353 University Ave., St. Paul, Minn., Archt.

N. Y., Brooklyn—The St. Marks Realty Co., c/o S. J. Kessler, Engr. and Archt., 529 Courtland Ave., New York, will build a 2 story, 75 x 130 ft. garage, here. Estimated cost $75,000.

N. Y., Buffalo—The Eberhardt Steel Products Co., Chelsa St., plans to build an addition to its mill. Estimated cost $5,000. Architect not announced.

N. Y., Franklinville—The Ontario Knife Co. plans to build an addition to its knife factory. Cost will exceed $5,000. Architect not announced.

N. Y., New York—The Atwell Contg. Co., c/o G. G. Miller, Engr. and Archt., 1482 Bway, will build a 1 story, 120 x 230 ft. garage on Jerome Ave. and 192nd St. Estimated cost $50,000.

N. Y., New York—The Harmon Realty Co., Inc., c/o Springsteen & Goldhammer, Engrs. and Archts., 32 Union Sq., will build a 1 story, 100 x 100 ft. garage on Freeman St. Estimated cost $30,000.

N. Y., New York—The Natl. Biscuit Co., 85 9th Ave., will soon receive bids for the construction of a 3 story garage and repair shop at 407 West 16th St. Estimated cost $65,000. J. R. Terrance, 85 9th Ave., Engr. and Archt.

O., Cleveland—The Brough Co., 3823 St. Clair Ave., bottlers, receiving bids for the construction of a 1 story, 40 x 70 ft. store building and a 1 story, 52 x 80 ft. garage on East 72nd St. and St. Clair Ave. Estimated cost $50,000. E. Brough, Mgr. J. Brugnone, 3505 Woodlawn Ave., Archt. Noted Nov. 9.

O., Cleveland—C. C. Deming, 2517 Edgehill Rd., Cleveland Heights, plans to build a 2 story, 60 x 80 ft. garage and commercial building at 3120 Carnegie Ave., here. Estimated cost $40,000. Private plans.

O., Cleveland—The International Harvester Co., Harvester Bldg., Chicago, plans to build a 10 story warehouse and service station, on East 55th St. and Julia Ave., here. Estimated cost $300,000. A. Price, c/o owner, Archt.

O., Cleveland—The Willard Storage Battery Co., 246 East 131st St., will build a 1 story, 15 x 300 ft. addition to its factory. Estimated cost $40,000.

O., Delaware — The Sunray Stove Co. plans to build a 60 x 100 ft. addition to its factory.

O., Norwood—A. Kahn, Archt., 1000 Marquette Bldg., Detroit, is receiving bids and will open same about Nov. 20 for the construction of a 2 story, 320 x 500 ft. automobile factory on Smith Rd., here, for the Chevrolet Motor Co., General Motors Bldg., Detroit.

O., Ravenna—The Phillips Body Co., c/o Fisher Body Ohio Co., Cass St. and Blvd., Detroit, have had plans prepared for the construction of a 1 story, 40 x 100 ft. addition to its factory, here. Estimated cost $40,000. Carter-Richards Co., 923 Illuminating Bldg., Cleveland, O., Archts.

Ore., Portland—The Skyline Corp., 801 Pittock Bldg., plans the construction of a 10 story and 2 story basement, and 200 x 200 ft. office building, basement to contain heating, power and light plants, also a 500 auto garage, on 5th, 6th, Taylor and Salmon Sts. Estimated cost $2,500,000. J. C. Gibson, Pres. Architect not selected.

Pa., Corry — The Corry Radiator Corp. awarded the contract for the construction of a 1 story, 120 x 150 ft. foundry at its radiator works.

Pa., Nanticoke — The Nanticoke Garage Co. is having plans prepared for the construction of a 3 story, 46 x 100 ft. garage, with a wing 84 ft. long, on Spring St. Estimated cost $65,000. G. T. Price, 409 Miller Bldg., Scranton, Archt.

Pa., Monessen—The Monessen Fdry. & Machine Co. plans to rebuild the portion of its shop which was destroyed by fire. Estimated cost $150,000. Architect not announced.

Pa., Newport—The Mineral Products Co. plans to rebuild its plant, which was recently destroyed by fire. Loss $25,000. J. R. Morgan, proprietor.

Pa., Phila.—L. J. Kolb, 10th and Reed Sts., awarded the contract for the construction of a 1 story 175 x 200 ft. garage at 1433 Parrish St. Estimated cost $44,000.

Pa., Pittsburgh—The Mack International Motor Truck Corp., 5911 Center Ave., awarded the contract for the construction of a 1 story, 120 x 280 ft. garage, sales and service station on Liberty and Gross Sts. Estimated cost $60,000.

Pa., Pittsburgh — The Studebaker Sales Co., 4724 Baum Blvd., is having plans prepared for the construction of a 2 story, 80 x 100 ft. addition to its garage and sales building. Estimated cost $40,000. G. H. Schwan, Peoples Bank Bldg., Archt.

Pa., Scranton—T. F. Leopard Estate, 505 Lackawanna Ave., awarded the contract for the construction of a 2 story, 80 x 130 ft. garage on Adams St. Noted Oct. 5.

Pa., Washington—H. Robinson plans to build a 3 story, 65 x 102 ft. garage on Chestnut St. Estimated cost $40,000. Architect not selected.

Pa., Waynesburg—T. Cochran, Dawson, is having plans prepared for the construction of a 2 story, 70 x 90 ft. garage, here. Estimated cost $40,000. H. W. Altman, Fayette Title & Trust Bldg., Uniontown, Pa., Archt.

R. I., Providence—Goldberger & Steiner, Olneyville Sq., are having plans prepared for the construction of a 1 story garage on Library Court. Estimated cost $40,000. G. Wolf, 88 Althea St., Archt.

Wis., Chippewa Falls—The Chippewa Valley Auto Co., 16 River St., awarded the contract for the construction of a 2 story, 124 x 130 ft. garage. Estimated cost $75,000. Noted Oct. 26.

Wis., LaCrosse—The Bergh Auto Co., 207 South 4th St., awarded the contract for the construction of a 1 story, 60 x 171 ft. garage on King St. Estimated cost $40,000.

Wis., La Crosse—O. A. Merman, Archt., 210 Linker Bldg., is receiving bids and will open same about Nov. 13 for the construction of a 1 story, 60 x 146 ft. garage on 6th and State Sts. for the Cameron Motor Car Co., 127 South 6th St. Estimated cost $40,000.

Wis., Marinette—C. Anderson & Sons Co., Cook and Merryman Sts., will build a 2 story, 50 x 75 ft. factory and machine shop on Main St. Estimated cost $75,000. Noted Oct. 19.

Wis., Menomonie—E. V. Johnson plans to build a 1 story, 58 x 176 ft. garage on Main St., to replace the one which was destroyed by fire. Estimated cost $40,000. Architect not selected.

Wis., Milwaukee—The Luick Ice Cream Co., 183 Ogden Ave., awarded the contract for the construction of a 1 story, 120 x 120 ft. garage on Van Buren St. Estimated cost $75,000. Noted Oct. 26.

Wis., Racine—The F. J. Greene Eng. Wks., 1028 Douglas Ave., awarded the contract for the construction of a 1 story, 70 x 125 ft. addition to factory. Estimated cost $15,000.

Wis., Racine—The F. J. Greene Eng. Wks., 1028 Douglas Ave., will soon receive bids for the construction of a 3 story, 53 x 100 ft. factory. Estimated cost $50,000. E. B. Funston Co., Janes Bldg., Archt. Noted Oct. 12.

Wis., Stevens Point—The F. & G. Auto Parts Co., 425 Madison St., is receiving bids for the construction of a 1 story, 35 x 102 ft. addition to its garage. Estimated cost $40,000. Private plans.

Ont., Aylmer—J. L. Thayer & Son plan to build a garage and automobile repair shop. Estimated cost $40,000.

Ont., Hamilton — The Abrasive Co. of Canada, Ltd., 858 Burlington St., awarded the contract for the construction of a 1 story, 40 x 60 ft. furnace building. Estimated cost $15,000.

Ont., Toronto—The Toronto Motor Car Ltd., 52 James St., plans to build a 3 or 4 story garage and sales room on Jarvis St. Estimated cost $100,000. L. E. Dowling, 167 Yonge St., Archt.

General Manufacturing

Calif., D'nuba—The Central California Ice Co., P and Mono Sts., Fresno, plans to build an ice plant on South M and Ventura Sts., here.

Calif., Emeryville—The Amer. Rubber Co., Park Ave. and Watt St., Oakland, awarded the contract for the construction of a 1 story factory on Emery and Park Sts., here. Estimated cost $25,000.

Calif., Livermore—The Livermore Soda Wks. has purchased a site on Lizzie St. and plans to build a soda water plant. G. F. Tubbs, owner.

Calif., Marysville—The Chamber of Commerce plans to build dehydrators for growers in Yuba county.

Calif., Marysville—Swift Bros., 2nd and E Sts., plan to build a planing mill on 3rd St.

Calif., Merced—The California Packing Corp., 101 California St., San Francisco, has had preliminary plans prepared for the construction of several large cannery buildings on 23rd St. from P to R Sts. and 22nd St. between Q and R Sts. P. L. Bush, 101 California St., San Francisco, Engr. and Archt.

Calif., Oakland—The California Packing Corp., 101 California St. San Francisco, is having plans prepared for the construction of a cannery on 1st and Filbert Sts., here. P. L. Bush, 101 California St., San Francisco, Archt.

Calif., Oakland—The East Bay Creamery Co., 18th St. and San Pablo Ave., awarded the contract for the construction of a 1 story creamery on N.E. 22nd and Market Sts. Estimated cost $24,000.

Calif., San Francisco—The Anderson Bros. Planing Mill Co., 2399 Powell St., will build a 2 story, 70 x 50 ft. planing mill on Quint St. between Burke and Custer Aves. Estimated cost $15,000.

Calif., San Francisco—The Banner Refining Co., Kohl Bldg., is having plans prepared for the construction of a refining plant, consisting of 2 buildings, oil storage tanks, etc., on Islais Creek. Estimated cost $84,000. F. G. White, Ferry Bldg., Engr.

Calif., San Francisco—The General Mfg. Co., Pacific Bldg., has had plans prepared for the construction of a 1 story box factory on San Bruno Ave. Estimated cost $40,000. W. W. Hanscom, 348 Clayton St., Archt.

Calif., San Francisco—The San Francisco Sulphur Co., 624 California St., awarded the contract for the construction of a sulphur refinery on North Point St. Estimated cost $35,000.

Conn., Harford—The Frisbie Pie Co., 363 Kossuth St., Bridgeport, awarded the contract for the construction of a 2 story, 90 x 100 ft. bakery and garage on Broad St., here. Cost between $50,000 and $60,000. Noted Oct. 26.

Conn., New Haven—The Ward Baking Co., Southern Blvd. and St. Marys St., New York City, plans to build a 2 story bakery on Lombard St., here. Architect not announced.

Conn., Waterbury — The Hamilton Bottling Wks., Burton St., awarded the contract for the construction of a 1 and 2 story, 30 x 70 ft. bottling plant. Estimated cost $15,000.

D. C., Wash.—The Corby Baking Co., 2301 Georgia Ave., N. W., awarded the contract for the construction of an addition to its bakery.

Fla., Daytona Beach—The Peninsular Ice & Cold Storage Co. will open bids about Dec. 1 for the construction of a 1 story ice manufacturing and cold storage plant. G. G. Bailey, Pres.

Ga., Athens—The National Roofing Co., Fillmore St., Tonawanda, N. Y., plans to build a branch factory for the manufacture of roofing products, here. Estimated cost $600,000.

Ill., Chicago—The Bassick Mfg. Co., 2638 North Crawford Ave., awarded the contract for the construction of a 1 story, 55 x 142 ft. factory for the manufacture of automobile accessories. Estimated cost $30,000. Noted Oct. 19.

Ill., Chicago—Dubin & Eisenberg, Archts., 14 West Washington Sts., are receiving bids for alterations and the construction of a 3 story, 75 x 98 ft. addition to factory at 1006-1010 West Maxwell St. for the Kosher Star Sausage Mfg. Co. Estimated cost $75,000.

Ill., Chicago—The Natl. Paint & Wall Paper Co., c/o C. Hatzfeld, Archt., 7 South Dearborn St., awarded the contract for the construction of a 1 story, 47 x 105 ft. factory at 4317 Grand Ave. Estimated cost $20,000. Noted Sept. 21.

Ill., Chicago—The X. L. Refrigerating Co., 1834 West 59th St., is receiving bids for the construction of a 1 story, 125 x 132 ft. factory on 59th and Aberdeen Sts. Estimated cost $60,000. A. G. Lund, 453 West 63rd St., Archt.

Ind., Lafayette—The National Refining Co., Kossuth St., plans to rebuild a portion of its oil refinery which was recently destroyed by fire. Estimated cost $100,000.

Kan., Atchison—The Blair Milling Co., 300 South 4th St., awarded the contract for the construction of a 6 story, 36 x 83 ft. plant, storage capacity 50,000 bu. Noted Oct. 5.

La., La Fayette—The La Fayette Sugar Refining Co. plans to rebuild its refinery which was recently destroyed by fire. Estimated cost $300,000. Architeect not announced.

La., Sterlington (Ouachita P. O.)—The Imperial Oil & Gasoline Products Co., plans to build large additions to oil refinery and gasoline works. Estimated cost $150,000.

Mass., Brighton (Boston P. O.)—The Boston Spun Silk Co., Western Ave., awarded the contract for the construction of a 2 story weave shed addition to its plant. Estimated cost $40,000.

Mass., Brighton (Boston P. O.) — The Market Paper Box Co., 132 Market St., will build a 2 story paper box factory on Western Ave. Estimated cost $20,000.

Mass., Brockton—The Lapworth Webbing Co., Sumner St., plans to build a 2 story webbing factory on South and Crescent Sts. Archts. not announced.

Mass., Holyoke—The Massachusetts Baking Co., Commercial St., awarded the contract for the construction of a 2 story, 75 x 100 ft. bakery, including ovens, garage, etc. Cost between $16,000 and $18,000.

Mass., Westfield—A. E. and L. O. Peck, Holcomb St., will build a 1 story, 75 x 160 ft. woodworking factory on Silver St. Estimated cost $30,000.

Mass., West Roxbury (Boston P. O.)—The Armstrong Knitting Mill, 2011 Centre St., awarded the contract for the construction of a 2 story addition to its factory. Estimated cost $10,000.

Mass., Worcester—Woodbury & Co., Inc., 274 Main St., (engravers and printers), will build a 2 story, 100 x 100 ft. factory on West Boylston St. Estimated cost $28,000. Private plans.

Mich., Kalamazoo—The Kalamazoo Paper Box Co., Kalamazoo and Pitcher Sts., plans to build a 3 story factory, to contain 15,000 sq.ft. of floor space, on North Pitcher St. Estimated cost $200,000. Architect not selected.

Minn., Minneapolis—The Lavoris Chemical Co., 52 Western Ave., awarded the contract for the construction of a 3 story, 45 x 110 x 143 ft. office and factory building on 3rd St. and 10th Ave., N. Estimated cost $125,000. W. H. Levings, Secy. Noted Oct. 12.

N. J., Camden—The Camden Pottery Co., Mt. Vernon and Orchard Sts., awarded the contract for the construction of a 2 story, 65 x 140 ft. casting shop, containing 2 kilns. Estimated cost $55,000.

N. J., Linden—H. B. Hardenburg & Co., Inc., manufacturer of novelties, awarded the contract for the construction of a 1 story, 171 x 171 ft. factory with miscellaneous buildings, including garage.

N. J., Newark—Dugan Bros., 287 Bway., Brooklyn, N. Y., are having plans prepared for the construction of a bakery on Abington Ave. and 3rd St., here. Estimated cost $200,000. M. N. Shoemaker, 15 Central Ave., Engr. and Archt.

N. J., Trenton—The Castanea Dairy Co., 234 North Broad St., plans to build a 3 story, 80 x 80 ft. plant. Estimated cost $100,000. W. A. Klemann, 1st Natl. Bank, Archt.

N. J., Trenton—The Enterprise Tire & Rubber Co., North Clinton Ave., plans to build a rubber factory. Estimated cost $6,000.

N. J., Trenton—The Jointless Fire Brick Co., 1130 Clay St., Chicago, plans to build a 1 story, 72 x 250 ft. brick manufacturing plant on New York Ave., here. Estimated cost $75,000.

N. Y., Auburn—Lockwood, Greene & Co., Engrs., 101 Park Ave., New York City, will soon receive bids for the construction of a weave shed, machine shop and additions to dyehouse and power plant, for the Firth Carpet Co., 62 South Division St., here. Estimated cost $140,000.

N. Y., Binghamton—The Link Piano Co., Water St. awarded the contract for altering and building an addition to its factory. Estimated cost $8,000.

N. Y., Buffalo—The Standard Milling Co., c/o A. E. Baxter, Engr., Ellicott Sq., is having plans prepared for the construction of a large flour mill, capacity 30,000 bbl. per day, on Outer Harbor.

N. Y., East Aurora—W. Zapf plans to rebuild the portion of lumber mill which was destroyed by fire. Estimated cost $45,000. Archt. not announced.

N. Y., Jamestown—Lockwood, Greene & Co., Engrs., Hanna Bldg., Cleveland, O., will soon receive bids for the construction of a 4 story, 75 x 175 ft. combing and spinning mill, here, for the Jamestown Worsted Mills, 335 Harrison St., manufacturer of men's and women's wear.

New York—The Iroquois Natural Gas Co., Iroquois Bldg., Buffalo, plans to build natural gas plants in Hanover, Arkport, Perrysburg and Gowanda.

N. Y., New York—The Reid Ice Cream Co., 79 West 132nd St., awarded the contract for the construction of a 2 and 3 story, 90 x 200 ft. factory, also a 30 x 55 x 200 ft. shed, west of 5th Ave. from 141st to 142nd Sts.

N. Y., New York—The H. Stern Lumber Co., c/o W. H. Gompert, Engr. and Archt., 171 Madison Ave., will soon receive bids for the construction of a lumber plant on 69th St. near Ave. A. Estimated cost $100,000.

N. Y., Niagara Falls — The Acheson Graphite Co., Buffalo Ave., plans to build an addition to its graphite factory. Estimated cost $5,000. Architect not announced.

N. Y., Rochester—The Newman Bros. Grain Co., 204 Troup St., awarded the contract for the construction of a 1 and 2 story addition to its grain mill, to contain 8,000 sq.ft. of floor space. Estimated cost $25,000. Noted Nov. 2.

N. Y., Rochester—The Powertown Tire Corp., 253 East Ave., is receiving bids for the construction of a 4 story, 40 x 60 ft. addition to its service works. Estimated cost $50,000. Hutchinson & Strutz, Cutler Bldg., Archts. Noted Aug. 10.

N. C., Elizabeth City—The Crystal Ice Co. is having plans prepared for the construction of a 1 story ice manufacturing plant. Estimated cost $100,000. Ophuls & Hill, 112 West 42nd St., New York City, Engrs. and Archts.

O., Akron—The General Tire & Rubber Co. has had plans prepared for the construction of a 1 and 3 story, 40 x 180 ft. and 60 x 100 ft. additions to its factory. Estimated cost $100,000. Osborn Eng. Co., Prospect Ave., Cleveland, Engrs. and Archts.

O., Cleveland—The Double Eagle Bottling Co., 6517 St. Clair Ave., is receiving bids and will open same about Nov. 17 for the construction of a 2 story, 30 x 60 ft. bottling factory. Estimated cost $40,000. J. Potokar, Mgr. F. J. Coghlan, 1782 Alcoy Rd., Archt.

O., Columbus—R. H. Erlenbusch Sons Co., 456 South High St., has had plans prepared for the construction of a 1 story, 32 x 52 ft. ice cream factory, including special refrigerating plant, on East Livingston Ave. Estimated cost $6,500. C. W. Bellows, 69 Ruggery Bldg., Archt.

O., Conneaut—The North Eastern Oil & Gas Co., plans to build an artificial gas plant in several units, capacity 2,000,000 cu.ft. per day. A process will be used, whereby natural and artificial gas can be mixed. F. B. Dunn, Pres.

O., Delaware—The Dept. Public Welfare, Oak and 9th Sts., Columbus, has had plans prepared for the construction of a 60 x 80 ft. power house, laundry building with wings each 30 x 90 ft., water plant, small pumping station, etc., at the Girls' Industrial Home, here. Estimated cost $125,000. W. H. Duffy, Dir.

O., Delaware—The Rainbow Tire & Rubber Co., 402 Southern Hotel, Columbus, manufacturer of tubes, is building a 100 x 300 ft. plant, here. C. E. Ross, Pres.

O., Warren—The Wadsworth Feed Co. plans to rebuild its 5 story flour mill and warehouse which was destroyed by fire. Estimated cost $100,000. J. X. Wadsworth, Pres.

Okla., Oklahoma City—The New State Ice Co., 2 West 3rd St., will build an ice plant. Estimated cost $250,000.

Okla., Stamps — The Blackfoot Lumber Co. plans to rebuild its planing mill which was recently destroyed by fire. Estimated cost $60,000. Architect not announced.

Pa., Catasauqua—The Bryden Horse Shoe Co. awarded the contract for the construction of a 1 story, 60 x 198 ft. factory for the manufacture of horse shoe calks.

Pa., Corry—The Corry-Jamestown Furniture Co. awarded the contract for the construction of a 1 story addition to its furniture factory. Estimated cost $5,000.

Pa., Glassmere — The Allegheny Plate Glass Co. awarded the contract for the construction of a 1 story, 50 x 600 ft. cast house for glass factory. Estimated cost $100,000.

Pa., Jacobs Creek—The United States of America Drug & Chemical Co. awarded the contract for the construction of a 2 story, 50 x 100 ft. chemical factory. Estimated cost $35,000. Noted Oct. 19.

Pa., New Castle—The Grasselli Powder Co., Guardian Bldg., Cleveland, O., will build a 1 story addition to its factory, consisting of six buildings, here.

Pa., New Castle—The New Castle News awarded the contract for the construction of a 2 story, 30 x 160 ft. printing plant. Estimated cost $75,000.

Pa., Phila.—The Amer. Ice Co., 6th and Arch Sts., and C. L. Weir, Engr., 41 East 42nd St., New York City, are receiving bids for the construction of a 2 story, 61 x 80 ft. and a 1 story, 21 x 80 ft. ice manufacturing plant on Duncannon and Mascher Sts.

Pa., Phila.—Ballinger Co., Archts., 12th and Chestnut Sts., will soon receive bids for the construction of a 2 story 74 x 194 ft. and a 1 story 141 x 193 ft. printing plant on 56th and Chestnut Sts., for the Chilton Publishing Co., 49th and Market Sts. Estimated cost $50,000.

Pa., Phila.—The Globe Ticket Co., 110 North 12th St., awarded the contract for the construction of a 9 story, 58 x 183 ft. and 34 x 47 ft. printing plant at 112-122 North 12th St.

Pa., Phila.—The United Gas Improvement Co., Broad and Arch Sts., plans to build a 2 story, 34 x 110 ft. fuel bins, consisting of conveyors system, also loading and unloading machinery. Estimated cost $115,000. Private plans.

Pa., Pittsburgh—The F. J. Kress Box Co., 3030 Liberty Ave., will soon award the contract for the construction of a 3 story, 70 x 155 ft. addition to its box factory. Estimated cost $40,000. T. Pringle, 504 Pittsburgh Life Bldg., Archt.

Pa., Pittsburgh—The Ward Baking Co., South Bend and St. Marys Sts., plans to build a bakery on Ridge Ave. Estimated cost $1,500,000. Private plans.

R. I., Woonsocket—The Macrodi Fibre Co., Carnation St., awarded the contract for the construction of a 1 story, 60 x 150 ft. textile factory. Estimated cost $40,000.

Tex., Dallas—The Trinity Paper Mills, Dallas County State Bk. Bldg., will receive bids until Jan., 1923, for the construction of a paper mill, capacity 30 tons per day. Estimated cost $500,000.

Tex., Texas City — The U. S. Gasoline Corp. is having plans prepared for the construction of a 4 unit Knox process cracking plant, capacity 100,000 gal. per day. Estimated cost $250,000. Company Engrs. and Archts.

Wis., Janesville — The Parker Pen Co., Court and Division Sts., plans to build a 2 story, 60 x 150 ft. factory on South Bluff St., for the manufacture of fountain pens. Estimated cost $50,000. Architect not selected.

Wis., Milwaukee—The A. C. Beck Co., 1 East St., manufacturer of boxes, awarded the contract for the construction of a 2 story, 60 x 135 ft. factory, to replace the one which was destroyed by fire. Noted Oct. 12.

Wis., Milwaukee—J. Wilging & Co., 1612 Teutonia Ave., building contractors, are receiving bids for the construction of a 2 story, 80 x 120 ft. millworking factory on Burleigh St. Estimated cost $45,000. Private plans.

Wis., Walworth—The Walworth Condensed Milk Co. will build a 1 story 14 x 60 ft. addition to its condensery, and a 24 x 44 ft. engine room. Estimated cost $20,000.

B. C., Nordin—The J. Buckley Estate plans to rebuild its saw mill which was destroyed by fire. Estimated cost $100,000.